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Electrical World

The Consolidation of Electrical World, Electrical Engineer and American Electrician

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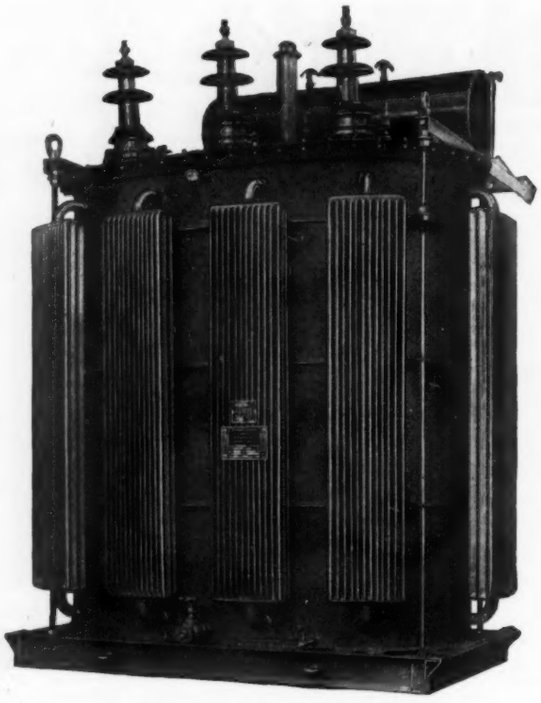


Pittsburgh Polyphase Transformer equipped with three Pittsburgh Tap Changers, cooled with Pittsburgh Film Radiators, protected by Pittsburgh Expansion Tank. See Pittsburgh Bulletin No. 2051.

Pittsburgh Transformer Tap Changer

THE Pittsburgh Transformer Tap Changer is mechanically simple,—and very rugged.

THE electrical design provides tremendous contact surface.

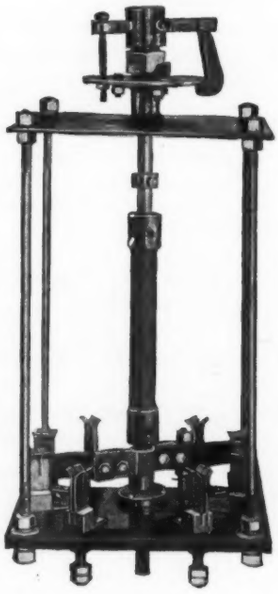
THE contact surface provided in the Pittsburgh Tap Changer is actually double the square inches per ampere that is standard practice in air switches.

THE contacts are a scraping, sliding contact.

THE result is that with the enormous contact surface provided the tap changer runs cool, because the current passing through these very generous contact surfaces will not heat the tap changer.

THE scraping, sliding contact provided, removes the film of oil and cleans all contact surfaces when changing taps.

AFTER all, actual service proves the dependability of apparatus, and not a single failure or complaint has occurred with reference to the mechanical and electrical operation of the Pittsburgh Tap Changer, although many thousands have been in daily use for years.



Pittsburgh Tap Changer

Pittsburgh Transformer Company

Largest Manufacturers of Transformers exclusively in the United States

Pittsburgh, Pennsylvania

Electrical World

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W. H. ONKEN, JR.
Editor

VOLUME 88 — *New York, Saturday, August 7, 1926* — NUMBER 6

Public Utilities and the Illinois Senatorial Primaries

THOSE public utility executives who manifested such a keen personal interest in the Illinois senatorial primaries last spring now find themselves in a rather embarrassing position. What motive they had, if any, in contributing so liberally to the campaign fund of Frank L. Smith, chairman of the Illinois Commerce Commission, as opposed to that of the incumbent, Senator William B. McKinley, chairman of the board of the Illinois Power & Light Corporation, has not been revealed by the Senate investigating committee. No doubt, when the time comes reasons in plenty will be forthcoming. Until then, however, judgment should be suspended.

But, ample as may be the mantle of charity that the electric light and power industry throws over the whole affair, there is no escaping the conclusions which the general public will draw. So long as we have party government men will contribute to party campaign funds. It costs money to canvass a state even though speakers and workers give their services gratis. This is a side to practical politics which every man recognizes. None the less, considering all the circumstances in the Illinois senatorial primaries, any excuse, however good, will be received with a smile of the incredulous variety.

The electric public utilities as a class have fought and, most people thought, conquered political interference and preferment. There is, nevertheless, a constant pressure brought to bear on all corporations, and particularly on those engaged in public utility service, for funds. These attempts must be steadfastly resisted if public relations are not to suffer. The work of years in fostering good will and confidence in the service of utilities and in the integrity of their leaders should not be jeopardized by one wrong move. Utilities should be above suspicion, and, if necessary, suitable legislation should be enacted to keep them so.

Preserve Local Contacts in Management

CENTRALIZED management continues to make striking headway in the utility field, but enduring success in this direction depends upon the preservation of local contacts—sometimes, indeed, upon their strengthening. Absentee landlordism without intimate territorial contact of personnel spells impaired public relations. The highest-grade engineering and financing are rewards of centralized management in countless cases, but these count for little if the administration of a company strikes the local public as impersonal, remote and mechanical in its handling of affairs. Fortunately the value of local contacts is appreciated by many holding companies and managing houses, but in many cases it will do much good to study afresh the limitations imposed on local authority and see if a larger measure of responsibility cannot safely be accorded.

In the attempt to standardize procedure it is easy to make the handling of local problems of less than major importance difficult and perhaps even discouraging to the local manager. Too much shifting of responsibility to the headquarters office undermines local public confidence in the standing of the manager on the ground, and it may be well to increase the minimum outlay and scope of decisions, which in many cases are allowed without reference to distant executives for their "O.K." Certainly those syndicates which give their local executives rope enough to enable them to grow into men welcoming responsibility and knowing how to use it and to make it tell among the people with whom they live and work find their reward in public relations of the best sort. In the long run such a policy costs the least in proportion to the results gained, both in local progress and in the larger planning of developments in syndicated properties as a whole.

Cleveland's New Plant

THE Avon station of the Cleveland Electric Illuminating Company, described in this issue, puts out its entire production of energy at 132 kv. The rapid advances in the art of power transmission, both aërial and underground, at high voltages have made possible the location of this power plant at what a few years ago would have been a great distance from the load. The location of Avon combines the advantages of best water and fuel facilities with a comparatively cheap site. It is no longer necessary for a plant supplying large quantities of energy for the demands of a heavily loaded metropolitan district to be located in the center of that district.

The new methods and devices incorporated in the design of this plant, some of which are still matters of more or less heated discussion among engineers, have all been proved out to the satisfaction of the Cleveland company in its Lake Shore station. Pulverized-fuel firing received a thorough test in that station, and its performance justified its inclusion in the new plant. The division of the station into separate operating units, each a complete power plant in itself and consisting of one turbine and two boilers, is an approved arrangement to secure economical and continuous operation. Phase isolation admits of some argument as to cost, but the vertical arrangement is the one which lends itself best to construction and operation and the scheme makes for safer operation.

The regeneration of heat with steam bled from the prime movers is a modern practice that has contributed its share to that increment of thermal efficiency which distinguishes the really modern steam-electric plant from the one that is only a few years old. In this station steam is bled from only one stage of the turbine although provision is made for additional bleeding points if their use is later found to be advisable.

A considerable number of comparatively minor features in the design of this station are worthy of at-

tention and consideration by engineers. Among these are the arrangements for the diversion of water that has already passed through the condensers into the intake canal. This water, warm in comparison with the incoming, will do much to prevent the formation of ice in the intake system during very cold weather. Other features will be revealed by a reading of the article in this issue. This station is welcomed as a major addition to the interconnected power systems which supply service to the rapidly growing Middle West territory.

The Real Appliance Sales Problem

THERE is a very natural tendency among power company executives to complacency over the progress that the industry is making in introducing electrical appliances into the home. The birth of the electrical era is of such recent memory, the growth of the American power system has been so spectacular, and the extent to which electric service has been adopted is so apparent to all, that it is not easy to feel dissatisfied with the results that have been recorded. It is not hard to understand, therefore, why many central-station men should resent the charge that they are not keeping up with the growth of the market for appliances, actually falling behind in the appliance saturation of the total of connected homes. They point out the fact that the houses being wired today are the smaller homes that are harder to sell. Apparently they overlook the point, however, that to make good the obligation of the power industry to provide the comforts of electricity to every connected home may demand harder, better and more effective selling on their part to these small homes.

Consider the case of Chicago, for example: Taking the amount of money spent for advertising in all the newspapers of Chicago as a basis of comparison, it is found that all the manufacturers of electrical appliances together spent $125,000 last year. The Commonwealth Edison Company used an equal amount of newspaper space, so that one may say that the electrical industry spent $250,000 there to make the householder buy appliances—a very sizable sum. But in the same period the radio manufacturers alone spent $996,000 and the radio dealers spent $350,000 more. The oil-burner manufacturers spent $500,000—this in addition to the advertising of all other industries. All this money was aimed at the householder's purse. And what was the result in the competition for the domestic dealer? To take the case of one very popular appliance, the sales of electric clothes washers in Chicago have fallen off greatly in the last few years, while 45 wet-wash services have come into the city and today are delivering 350,000 bundles a week, which is 100,000 more than they handled a year ago. And the wet wash is not an expedient for economy. The average bill for the wet wash is $1.62 a week. But the men behind this industry are carrying on a continuous and intensive house-to-house selling campaign, offering premiums for prospective customers, and so on. They are apparently outselling the electric clothes washer. The electrical appliance is being outsold generally by other appeals to the household purse.

It is easy enough to explain away the fact that the number sold of any appliance in any city each year is so far below the total number of houses wired on the ground that today smaller and smaller houses are being wired. But the families living in these small homes possess modern bathrooms and motor cars. Who is to say how many electrical appliances they can or will buy? Who knows? Better and better selling will put more and more appliances in smaller and smaller houses.

Commercial Possibilities of the Electric Light and Power Industry

IT WAS generally agreed at the Atlantic City convention of the National Electric Light Association that the electric public utility companies could do more in a commercial way to popularize electric service and to encourage the sale and use of electric appliances of all descriptions. An admirable address by Samuel Insull of Chicago, replete with statistics and data, was made at that convention, and in it Mr. Insull gave some conception of the possibilities still available in the electric public utility field to those who seek. Other executives re-echoed Mr. Insull's sentiments and urged that this coming year be marked by more intensive development of existing services and greater expansion along commercial lines.

It is now almost three months since the National Electric Light Association met at Atlantic City and time obliterates many memories. The lesson brought home at the convention, however, should not be lost; neither should aggressive action on it be long delayed. Mr. Insull's address has been reprinted by the N.E.L.A., and executives and all utility men owe it to themselves, their companies and the public to read, mark, learn and inwardly digest the entire speech. Mr. Insull paints a picture pleasant to behold and convincing enough to convert all doubters.

Stealing Electrical Energy Is Theft from Customers

LOUIS H. EGAN, president of the Union Electric Light & Power Company, St. Louis, recently stated that the company was losing approximately $100,000 a year as a result of the diversion of electrical energy by means of jumpers. On an average, three persons a day were discovered using devices to obtain electricity without paying for it. Not long ago a representative of the New Orleans Public Service, Inc., expressed a doubt whether any other company in the country could be suffering more thefts of energy than his company.

The extent to which this problem is encountered by different light and power companies is obviously dependent on the general character of the population served. It also depends to a considerable degree on whether service connections to meters are steel-clad and sealed against tampering. Such theft may predominate among illiterate classes or those which do not include petty thievery in their conscience as crime, but it has been known to involve educated persons who adapt their honesty to the size of the theft or the concern from which something is stolen.

Laws exist in most states which attach a penalty to theft of energy, but the prima facie evidence usually essential almost requires catching a person in the act of "jumpering" a meter. Since a home is under the jurisdiction and control of the occupant, further evidence would seem unnecessary where a jumper is found around a meter which was previously clear. In some states the owner of an automobile is liable for all accidents caused by the vehicle whether it is in his possession or

not. Why should not the occupant of a home be responsible for diversion of current within his home? If laws to this effect can be enacted in any state and verdicts obtained, the way to proceed will be made clear to the whole country. Meanwhile, insisting on metal-clad services and connections to meters that will make it difficult for persons with elastic honesty to pilfer energy should help, although there remains the ingenious thief with enough skill and knowledge to circumvent the mechanical protection.

Extensive distribution of utility securities among all classes of the public—and this can be done by selling as low as one share on the installment basis—will probably help to cut down theft as much as anything, because customer ownership can be made to interest every investor in the company's business. That customer ownership has had this effect is indicated by a case where the central-station company received a telephone call from an unknown woman who suggested that an inspector investigate a certain home for theft of energy. Upon being asked what made her think that the customer was stealing energy, the informer replied that the woman boasted of being able to obtain part of her energy free and showed her how, adding that the company was rich anyway and would not miss the revenue. Curious to know why the informer had informed the company, the utility representative asked her. "Well, you see," she replied, "I own some company stock." Although it cannot be expected that every customer stockholder will turn informer, education of these customers in the fact that stealing energy is really stealing from the thousands of investors and delaying the day when rates can be reduced should interest them in becoming guardians of the service to the extent of pointing out to predatory neighbors the error of their way.

Expensive Bulbs Are Often Unnecessarily Used

INCANDESCENT lamps of special shapes, such as the spherical bulb and the tubular bulb, are not very important factors in lighting, and where they are used such lamps are often unnecessary. In the home, where good lighting demands that all bulbs be equipped with shades or inclosing and diffusing media, there are few sockets where the regular lamp bulb is not thoroughly satisfactory. It costs less, it is more efficient and generally it is more durable or of longer life. Notwithstanding the current prevalence of "spherical-bulb" fixtures on display, only 9 per cent of all the lamps in the interior of homes at the present time have such bulbs. If all the sockets in the home were properly equipped with shades or inclosing media, virtually all sockets could be equipped with standard lamps.

Moreover, there are places besides homes where special bulbs are used unnecessarily. In large interiors such as ballrooms, hotel lobbies, etc., unshaded lamps of the smaller sizes are not always objectionable if the bulbs are frosted. In such cases the spherical, and sometimes the tubular, bulb is justifiable from an artistic viewpoint. Still, their use is generally overdone. In some hotels, for example, spherical bulbs are found in portable lamps, in toilets, in hallways and in many other places where the standard lamp would be less expensive, more satisfactory and certainly not less desirable from an artistic viewpoint. Likewise, the tubular lamp is often found on chandeliers, in bedside lamps, etc., where it could well be replaced by a regular lamp to the profit and general satisfaction of the user. There is, in fact, no doubt that many lamp salesmen and lighting service men are missing opportunities of real service to the consumer by not seeing to it that the standard lamp replaces the special lamp where the latter is unnecessary.

Knowledge and Organization Needed in Domestic Refrigeration

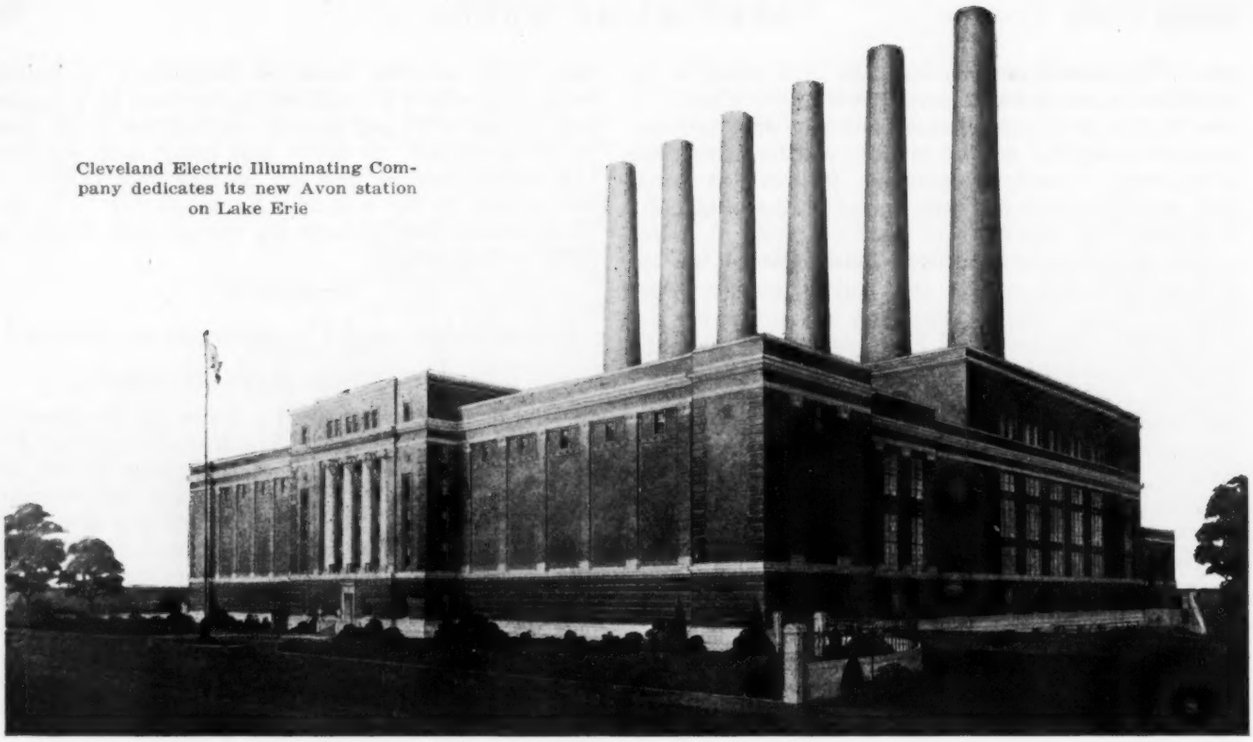
THE public has expressed a desire for the domestic electrical refrigerator. The manufacturers of this device and those in control of their sales outlets are trying to meet the demand intelligently and economically. The electric utilities seek to add this new device to their lines as it is a good consumer of electricity and increases the value of service to customers.

Very naturally many problems are encountered in the bulk manufacture and sale of this useful and popular household device. Mass production and mass distribution cannot be instituted instantly and successfully when only a nucleus of knowledge and experience has been had. Nor has knowledge been available whereby the market can be measured in terms of future demand in the degree that intelligent investments can be made in manufacturing, distributing and servicing facilities. Local troubles about delivery, about installation faults, about defective parts, about servicing costs crop up continually. Individual methods of organization and sale have been developed to meet local conditions or as a matter of expediency. These things are a natural result of the introduction of a new device on a large scale and are not fundamental.

Sufficient experience has now been had to show that the manufacture and sale of domestic electric refrigerators must be organized to serve the needs of the buyers. Manufacturers can rest assured that the domestic refrigerator market is very large, but they must also recognize that service on deliveries, a uniformly good product, adequate service on spare parts and the use of schools and other agencies to train sales and service men are essential. Utility merchandising departments must organize to sell the refrigerator intelligently and devote the necessary money and brains to pioneering effort. Dealers and other distributors must co-operate in this business on the basis of the quickest and best service to customers.

There is too much at stake to permit conservatism, laziness or expediency to build handicaps to the widespread use of this valuable and well-tried device in American homes. Organization and business principles must supersede hit-or-miss policies if the domestic electric refrigerator is to attain success without encountering pitfalls and setbacks.

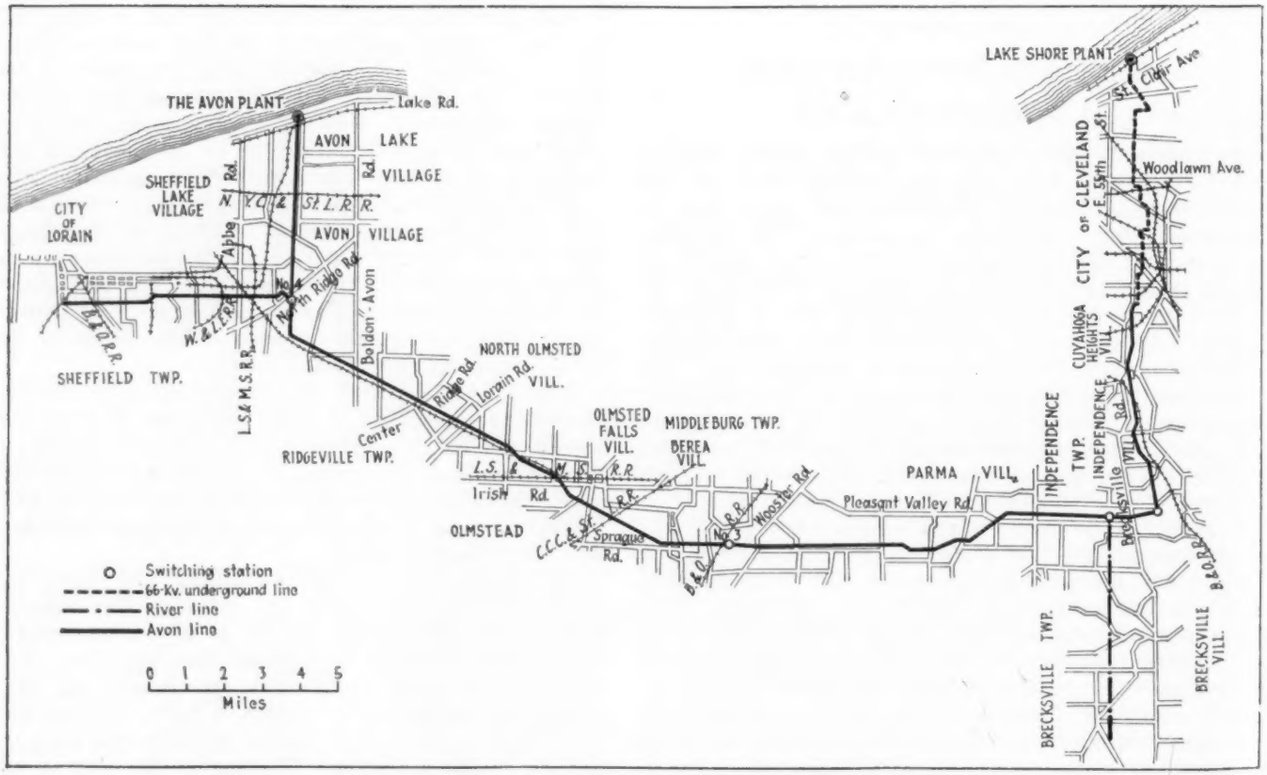
To help bring to bear all the thought and experience on this matter existing in the industry, the editorial staff of the ELECTRICAL WORLD is now conducting a nation-wide survey of the refrigeration situation. The hearty co-operation of utilities and dealers has permitted the compilation of a mass of facts, opinions and experiences which will be studied and digested for publication in the magazine. Nothing in the way of expense and effort has been spared to help the industry organize to do the best possible job in the sale of domestic electric refrigerators.



Cleveland Electric Illuminating Company dedicates its new Avon station on Lake Erie

Cleveland Has New Power Station

INITIAL section of the 300,000-kw. Avon station of the Cleveland Electric Illuminating Company uses pulverized fuel under boilers and two 35,000-kw. turbo-generators. Interconnection with the existing Lake Shore station makes available to Cleveland a reliable and abundant electric power supply. The new station was opened formally this week.

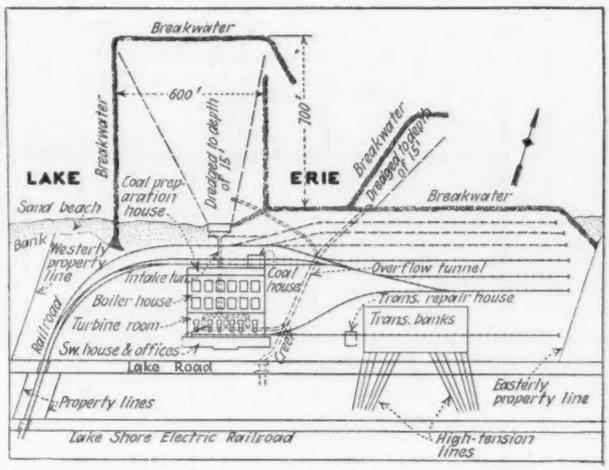


Interconnection between Lake Shore and Avon power stations

Features of Avon Station

New Plant of Cleveland Electric Illuminating Company Operates on Regenerative Cycle, Using Pulverized Fuel Exclusively—Reliability, Simplicity and Safety Predominate in Electrical and Mechanical Design

TO MEET the increasing demand for electricity in Cleveland and adjacent territory, including several hundred square miles along Lake Erie between Avon and the Pennsylvania state line, the Cleveland Electric Illuminating Company will put into service early in August the initial section of a 300,000-kw., pulverized-fuel, steam-electric plant. The site of this plant is at Avon, 23 miles west of the Public Square in Cleveland, and consists of 28 acres of land situated on the shore of Lake Erie. This location insures an unlimited supply of good condensing water and has the additional advantage of excellent rail facilities.



PLAN OF SITE, SHOWING ARRANGEMENT OF STRUCTURES, RAILROAD CONNECTIONS AND MARINE WORK

It is interconnected with the company's present 288,000-kw. plant, Lake Shore station, in Cleveland at East 70th Street and the lake. The interconnecting 132,000-volt transmission line makes a loop around the western and central portion of Cleveland, then is led for 8 miles underground across the center of the city, 66,000-volt cable being employed.

The architectural treatment of Avon station and the landscaping of the grounds lend dignity and beauty to the site, which nature has made picturesque. The main building, which is a monumental type of red-face brick with buff sandstone trim, sets back 50 ft. from the main highway and includes, from north to south, as shown in the ground plan, car unloading house, coal preparation house, boiler room to house twelve boilers, a turbine room to accommodate six main units and a combination switchhouse and office building. The present building program calls for the construction of two-thirds of the ultimate plant, together with the installation of two 35,000-kw. prime movers and four 3,060-hp. pulverized fuel-fired boilers operating at 400-lb. pressure.

Avon operates on what is commonly known as the regenerative cycle—that is, the main unit is bled at several points and the steam thus obtained is used for heating the condensate in a series of closed heaters. For the present only one bleeding point is employed, with provision for increasing the number if found advisable. The boiler plant is designed for the exclusive use of pulverized fuel, following the company's very satisfactory experience with similar type of equipment at its Lake Shore station.

Coal Handling.—An adequate supply of coal has been assured by the provision of storage facilities for more than 275,000 tons of coal and three main trunk-line interconnections, through the medium of the company's railroad. For storing or reclaiming the coal, a combination skip hoist and drag scraper is employed, having a capacity of 350 tons per hour. The storage site is ideal for this type of equipment and has the added advantage of being well situated for supplying the company's other plants in emergency cases.

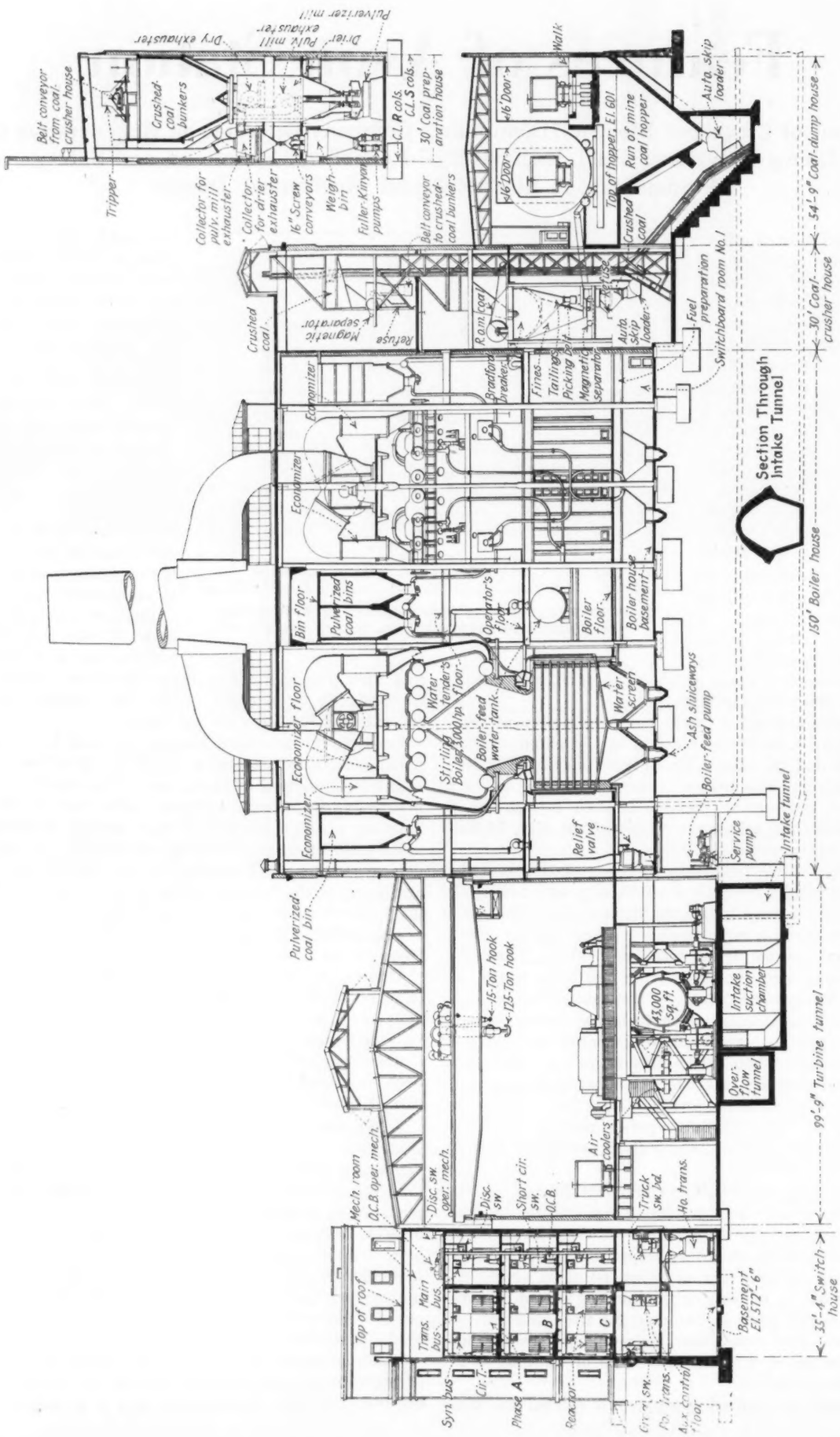
Coal is received at the plant in standard open-top railway cars, is first weighed and then unloaded into a large receiving hopper either manually or by a 60-ft. rotary car dumper having a capacity of twenty cars per hour.

Leaving the receiving hopper, the coal is elevated by a balanced skip hoist to a 12x19-ft. Bradford breaker. where it is reduced to 1¼-in. size. This breaker consists primarily of a large cylinder, with perforated sides, rotating about a horizontal axis slightly inclined, provided with internal projections or shelves. As the cylinder revolves coal is carried to the top of the shelves and falls to the bottom, where it is broken by impact. This procedure is continued until the coal is reduced to a size sufficiently small to pass through the perforations in the sides.

Unbroken coal, together with foreign matter, is discharged at the lower end of the breaker onto a picking belt, at which point the foreign matter is removed, the residue passing to the receiving hopper. To prevent a shutdown due to outage of this machine, a bypass has been provided at the entrance to the breaker, which can be used to good advantage with slack coal.

After passing the breaker the crushed coal is carried over a set of magnetic separators, where any remaining iron or steel is removed, and is again delivered to the skip hoist for further elevation to the upper part of the preparation plant. Here it is dumped over a second set of magnetic separators onto a distributing belt, which runs the entire length of the building immediately above the crushed coal bunkers. A traveling tripper distributes the coal as desired to the various storage bunkers, where it remains until it is carried to the pulverizers.

The equipment as installed has a capacity of 250 tons of bituminous coal per hour of sufficient size to care for the ultimate coal requirements and is arranged so that



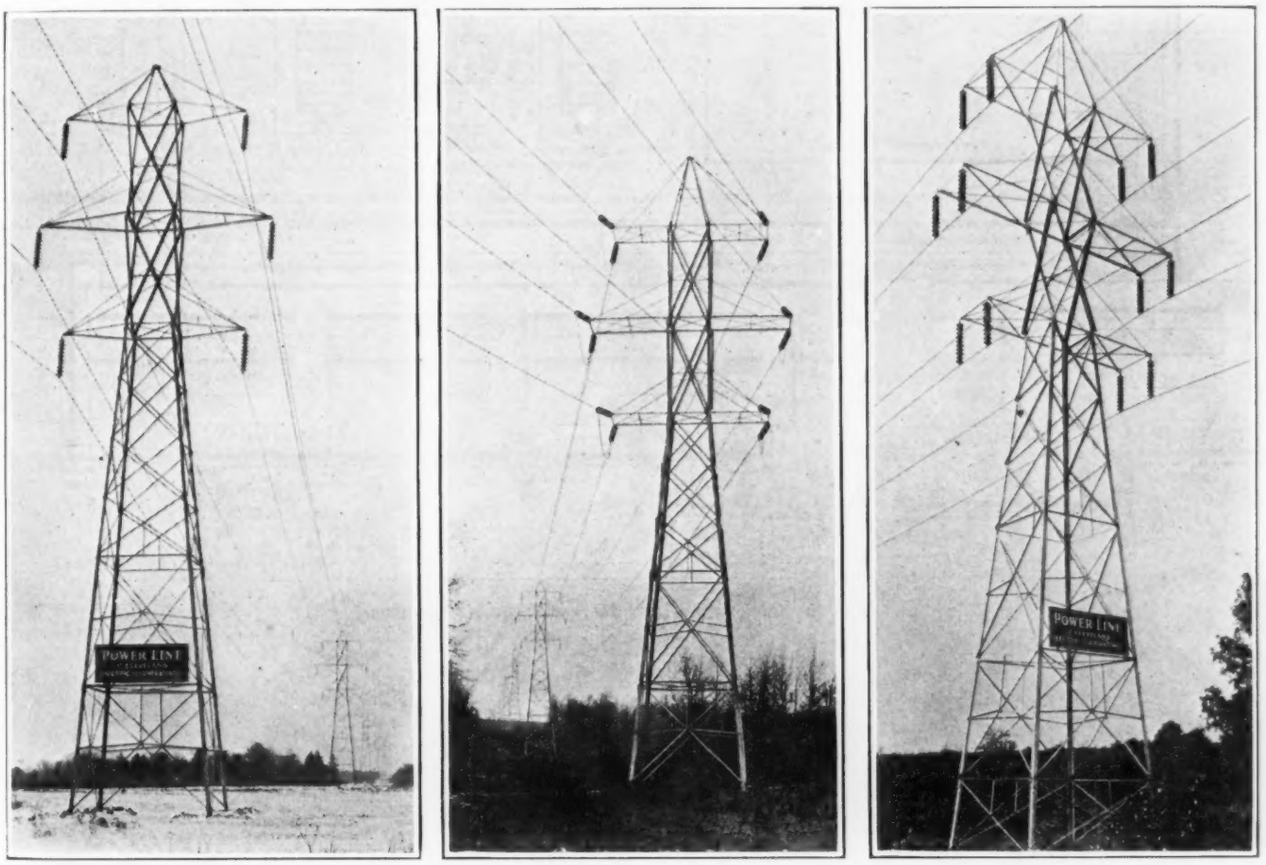
CROSS-SECTION THROUGH AVON POWER STATION

future plant extensions will require only lengthening of the distributing belt conveyor. With the exception of the rotary car dumper, the entire coal-handling equipment is electrically interlocked to prevent clogging of the system in event of failure or stoppage of any one portion. The entire coal plant is operated by 440-volt, three-phase, 60-cycle motors.

Pulverizing Equipment.—On its way to the pulverizers the crushed coal flows by gravity through a steam-heated drier of ample size to remove all moisture in excess of 3 per cent, thereby eliminating excessive mill maintenance and reduced capacity.

The actual pulverizing is accomplished by means of four fifteen-ton-per-hour, six-roll impact mills. The powdered coal is removed from the mill by a motor-driven exhauster fan into a cyclone separator, whence it is transported by either one of two screw conveyors to the weighing tanks.

After weighing, the coal is transferred by means of a screw pump and compressed air to the 96-ton pulverized fuel bunkers located above and in front of each firing side of the boilers. This system consists principally of a series of pipe lines and bin level indicators, so arranged that fuel can be supplied to any bunker as desired.



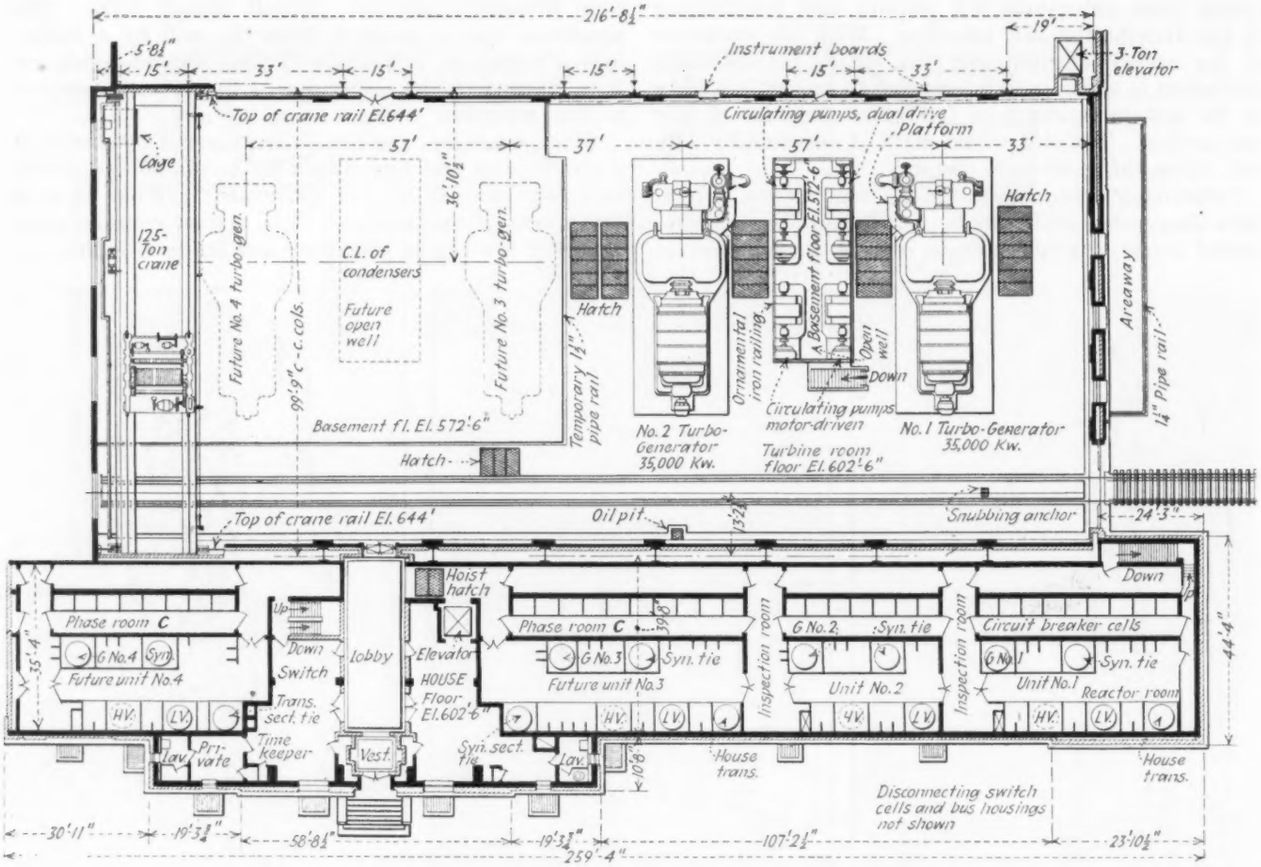
LINE, ANGLE AND ANCHOR TOWERS, 132,000-VOLT LINE, CONNECTING AVON AND LAKE SHORE STATIONS

TABLE I—MOTOR-DRIVEN EQUIPMENT, AVON STATION

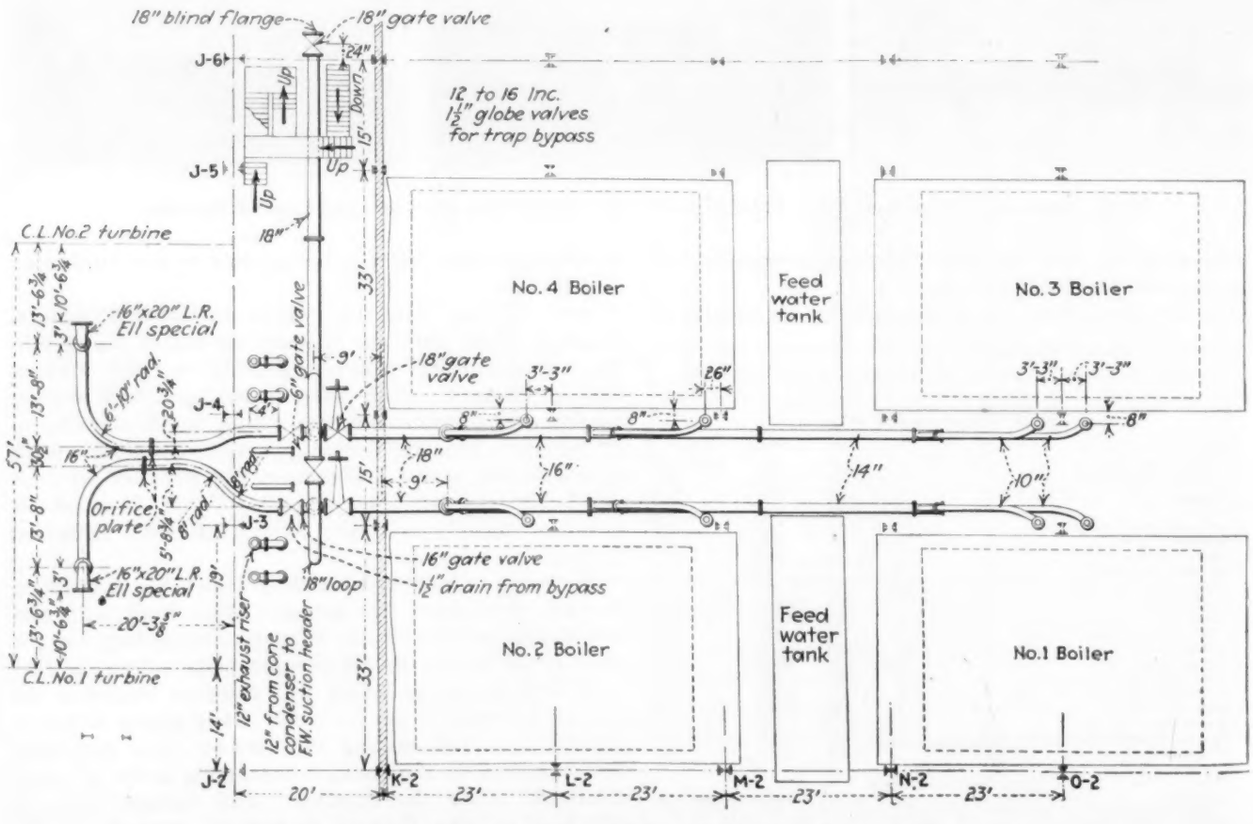
Motor for	No.	Hp.	Voltage	R.p.m.
Alternating-Current Motors				
Coal storage skip hoist	1	125	440	1,200–400
Coal storage drag scraper	1	150	440	720
Car dumper	1	50	440	720
Skip hoists	2	66	440	1,200–450
Magnetic separator conveyor	4	5	440	1,200
Reciprocating feeder	1	10	440	1,200
Bradford breaker	1	100	440	600
Picking belt conveyor	1	5	440	1,200
Distributing belt conveyor	1	25	440	1,200
Pulverizing mills	4	200	2,200	450
Exhauster fans	4	100	2,200	1,200
Screw conveyors	2	25	440	900
Fuel pumps	2	100	2,200	900
Primary air fans	8	75	2,200	1,800
Induced draft fans	4	300	2,200	475–166
Circulating pumps	4	250	2,200	300
Condensate pumps	4	100	2,200	1,200
Intake screens	3	7½	440	900
1,500-g.p.m. house service pumps	2	150	2,200	1,800
Air compressors	2	200	2,200	720
Direct-Current Motors				
Fuel feeders	64	1½	230	2,000–500

Next the coal flows by gravity to the fuel feeders, where it mixes with the primary air and is blown into the boiler furnace through slightly inclined vertical fan-tail burners. Each boiler is equipped with sixteen feeders and burners, eight to a side, the feeders being of the single type and driven by a 1½-hp., variable-speed, direct-current motor. There are two primary air fans per boiler, one per side, of 11,000-C.F.M. 20-in. static pressure capacity driven by 75-hp., 2,200-volt induction motors.

Furnaces.—Each twin Stirling boiler has a common furnace, fired from two opposite sides, built with air-cooled side walls and ash hoppers. Secondary air for combustion enters the air passage surrounding the furnace through Bailey hollow wall dampers located in the non-firing sides of the furnace. As it passes either to the right or left around the furnace it is preheated and admitted to the furnace through a series of ports arranged below the burners. The furnace interior, which is of the Detrick suspension type, is totally



GENERAL PLAN OF TURBINE ROOM AND SWITCH HOUSE

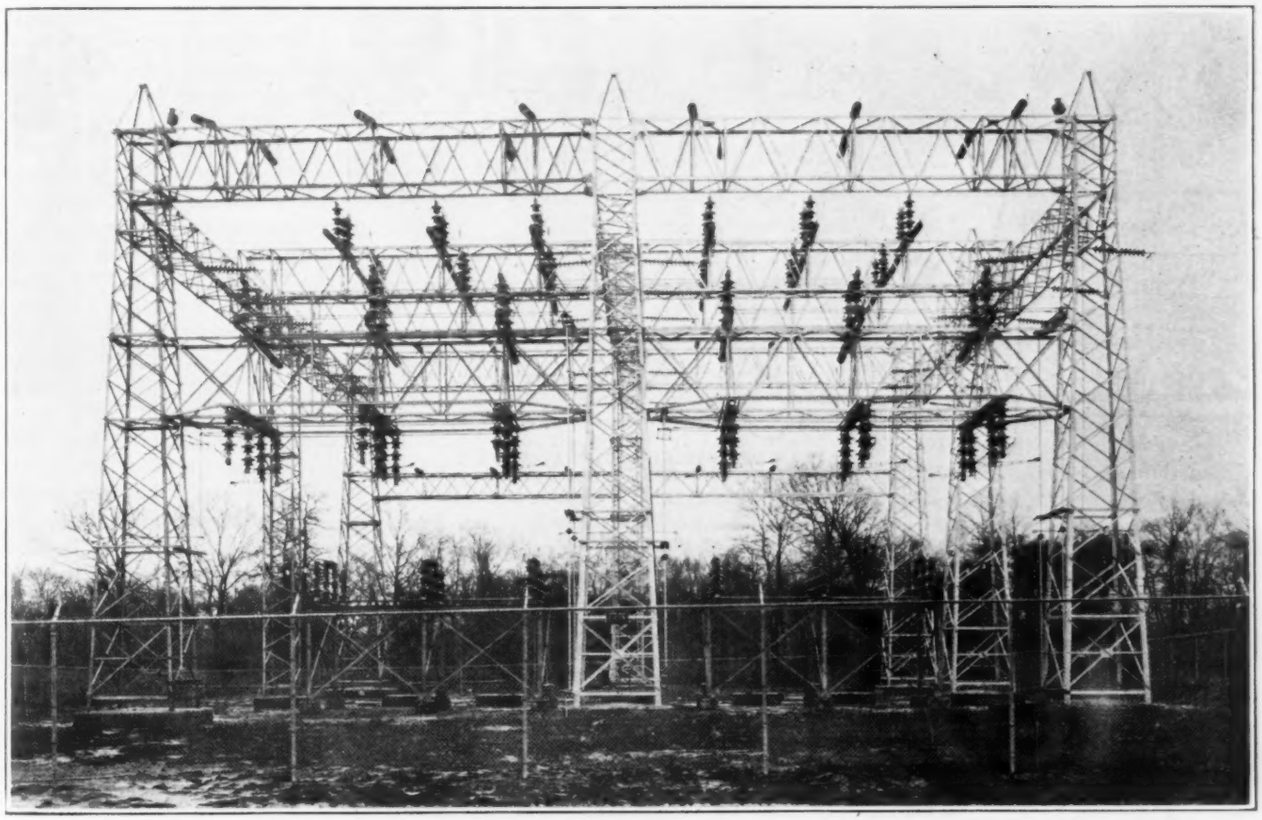


DETAIL PLAN OF MAIN STEAM PIPING BELOW OPERATING FLOOR, BOILERS 1 TO 4

inclosed by a steel casing, lined with Sil-O-Cel insulating brick.

Connected into the boiler circulating system is a water tube screen extending across the lower portion of the furnace, having an effective heating surface of 792 sq.ft. This screen serves to solidify the molten particles of ash, which are deposited in the ashpit below, thereby preventing damage to refractories and boiler tube slagging. Each boiler has a furnace volume, above water screen, of 30,600 cu.ft.

Ash disposal is effected by means of air-operated ash gates and hydraulic sluiceway serving all boilers. For the present no provision has been made for removing the ash from the site, as this material will be used for filling on the property.



132,000-KV. SWITCHING STATION NO. 1

Boiler Room.—The accompanying diagrams indicate the general arrangement of the equipment in the boiler room. The boilers are arranged on both sides of the room, with three firing aisles paralleling the axis of the turbine room. The present boiler room is 211 ft. long, 150 ft. wide and 109 ft. high, of sufficient size to accommodate eight boilers.

Four 415-lb. twin Stirling boilers are installed, which operate at 390-lb. pressure and a total steam temperature, including superheat, of 725 deg. F. Each boiler has 30,600 sq.ft. of water heating surface, 6,550 sq.ft. of superheating surface and 21,120 sq.ft. of economizer surface. At maximum capacity each boiler is capable of producing upward of 340,000 lb. of steam per hour, which is sufficient to maintain approximately full load on one of the main units.

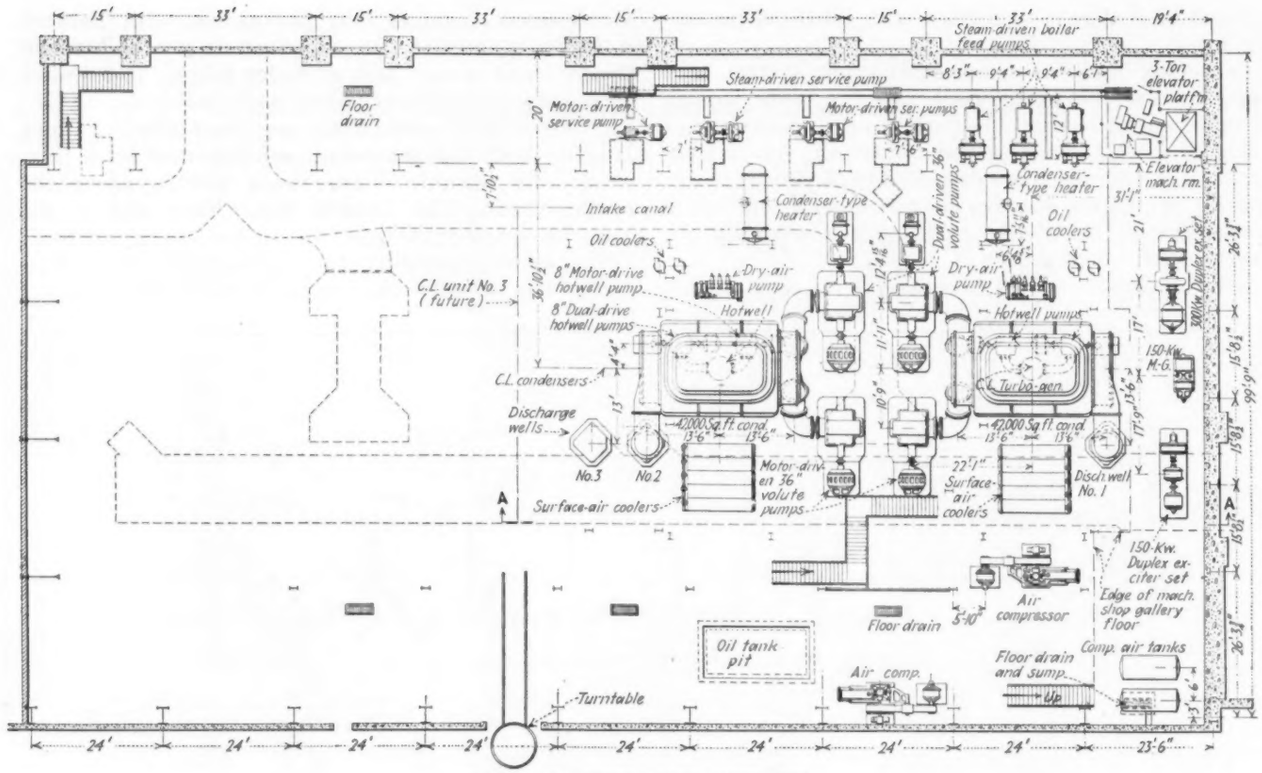
The steam drums of these boilers are 43 in. diameter, 34 ft. long and 1⅛ in. thick, with mud drums 48 in. diameter, 28½ ft. long and 2 in. thick. The baffling arrangement requires four gas passes, with Babcock & Wilcox connection type superheaters located between the first and second bank of boiler tubes. Two Foster steel tube economizers serve each boiler.

Furnace draft conditions are maintained by one induced draft fan per boiler, supplemented by a reinforced tile concrete stack, rising 249 ft. above the burner level. The induced draft fans are of the conoidal, single-inlet type, driven by 300-hp., 220-volt B.T.S. motors, designed for a maximum static pressure of 6 in. of water when passing 195,000 cu.ft. gas per minute. Each stack will serve two boilers, being 17 ft. inside diameter at the top and 175 ft. high, having two diametrically opposite breeching connections.

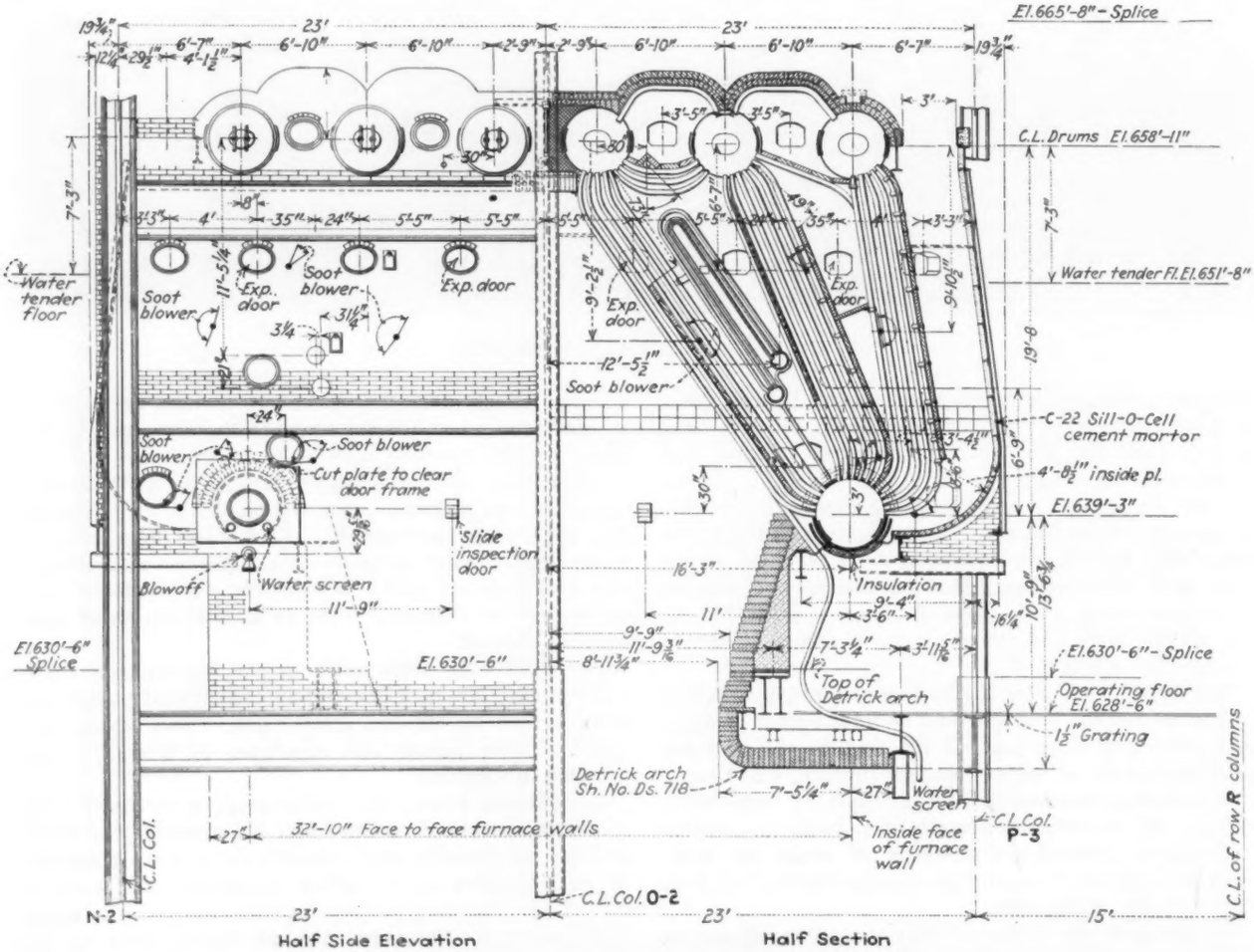
All boilers and economizers are fitted with steam-operated soot blowers and a complete line of recording and indicating instruments. Feed-water regulation is controlled by hand, as previous experience with similar size and type of boiler has proved very satisfactory. All boilers are equipped with the Bailey system of combustion control.

For delivering feed water to the economizers three 1,250-g.p.m., 500-lb. Lecourtenay centrifugal pumps are used, driven by 500-hp., 2,500-r.p.m. Terry steam turbines. These pumps are regulated by Foster excess pressure governors.

Feed-Water Cycle.—In maintaining a constant feed-water temperature of 200 deg. F. entering the economizers, all feasible heat recovery devices are employed in such manner as to afford reliability and ease of operation. Starting at the condenser hotwell, the water first passes to the generator air cooler, next to the condenser steam air ejector, and then to a 15,000-sq.ft. closed heater, which is supplied with steam bled from



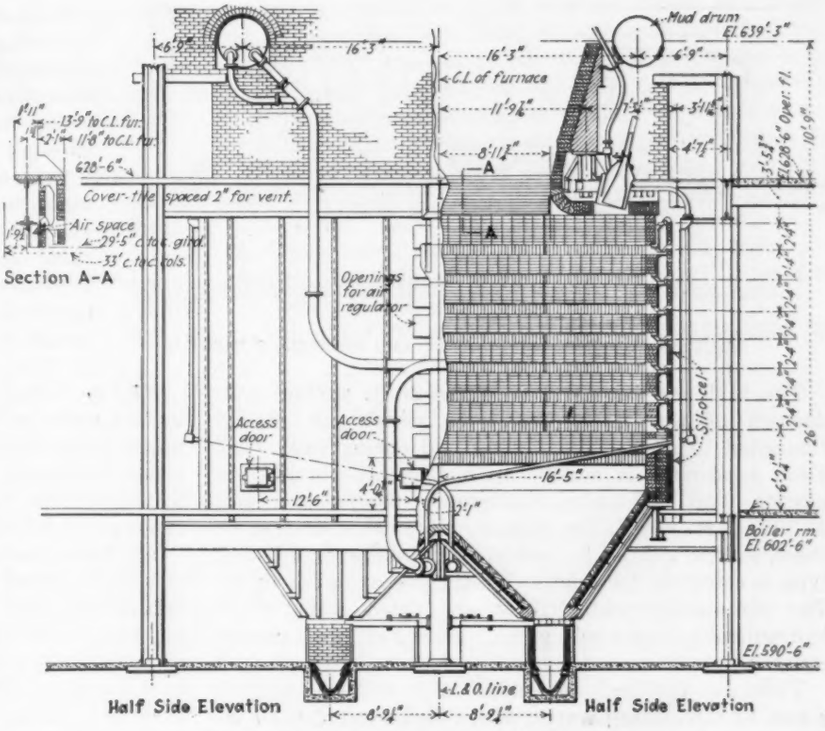
PLAN OF TURBINE ROOM BASEMENT



SIDE ELEVATION AND SECTION OF BOILER SETTING

the fourteenth stage of the main unit. Leaving this heater, it is elevated to a small barometric jet heater condenser, where it mixes with the exhaust from the plant steam-driven auxiliaries. From here it flows to the feed-water suction header, with a cross-connection to a 170,000-lb. capacity storage tank, which compensates for the line surge during periods of unbalanced steam conditions between boilers and main units. De-aëration is effected by placing the barometric jet heater condenser at a point in the boiler room about 100 ft. above the main condenser hotwell. Venturi meters are used for measuring the feed water.

Turbine Room.—Probably the most impressive portion of the entire plant is the turbine room, where simplicity of arrangement and a very pleasing color scheme are the predominating features. The operating floor, which is 100 ft. wide and 216 ft. long, contains only the prime movers, all other auxiliary equipment being located at the basement floor level, to which easy access is provided through large light wells and covered with hatchways. The walls are a combination of two shades of buff-colored brick and terra cotta, treated in a classic design of brick pilasters. The floor is of red tile, with machine casings, railings, fixtures and doors carried out in a green and bronze color combination. Ample lighting is provided by a large skylight extending the full length of the room, together with long panel windows at each end.

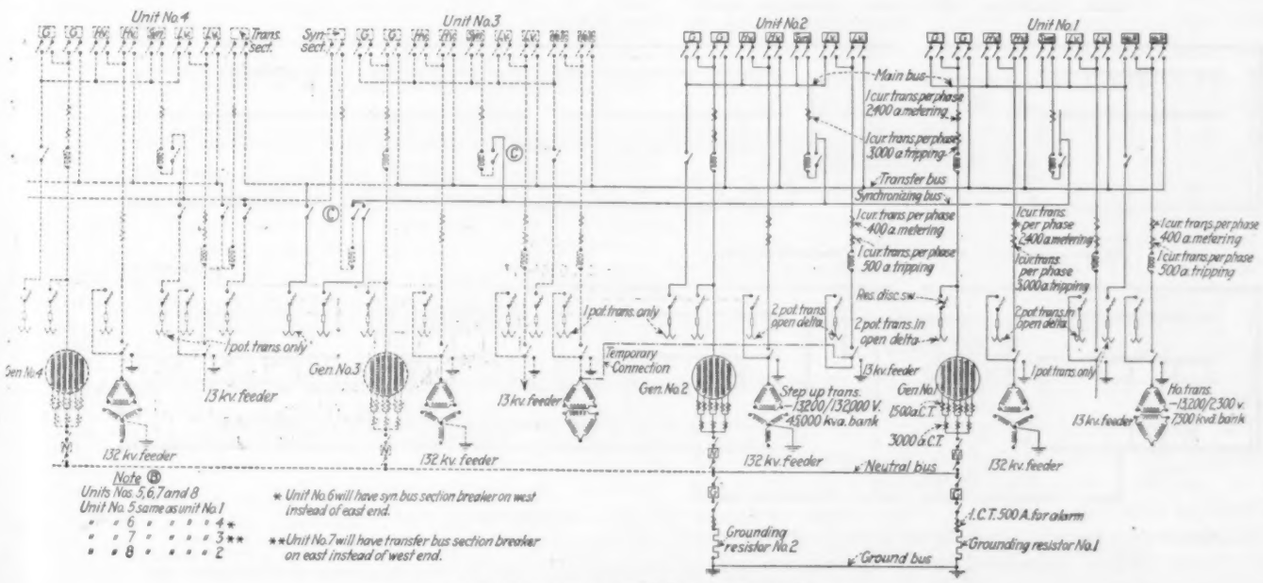


HALF SIDE ELEVATION OF BOILER SETTING

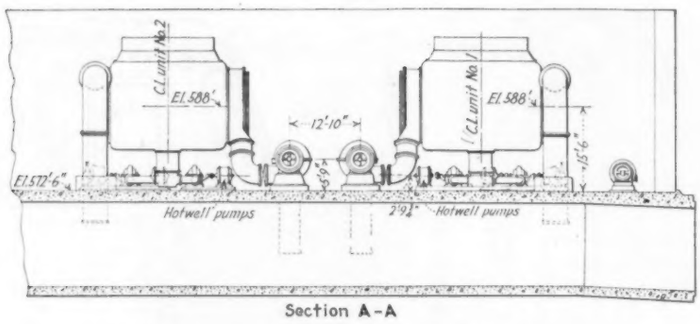
The present room houses two 35,000-kw. units, but it is of ample width to accommodate 50,000-kw. machines. Serving this room is a 125-ton electric traveling crane and a standard gage railroad track, which extends full length on the generator side.

At present two turbo-generators are installed with their shafts crosswise of the turbine room and steam ends toward the boiler house. Both units are General Electric 80 per cent power factor, seventeen-stage, 1,800-r.p.m. machines, having a continuous rating of 35,000 kw. and a peak capacity of 40,000 kw. Steam is supplied to the turbine throttle at 375-lb. pressure and 700 deg. F. total temperature.

Electrical characteristics of both generators are the same, being 13,200 volts, three-phase, 60-cycle, with excitation provided by direct-connected exciters or by auxiliary equipment. Each generator is equipped with a 15,000-sq.ft. fin-type surface air cooler and a totally inclosed ventilating system, provided with atmospheric relief doors. Fire protection is supplied in the form of high-pressure steam jets inserted in the end bells of the generators.


Unit No.4
Unit No.3
Unit No.2
Unit No.1
Trans. sect.
Sym. sect.
Main bus
1 cur. trans. per phase 2400 a. metering
1 cur. trans. per phase 3000 a. tripping
Transfer bus
Synchronizing bus
1 cur. trans. per phase 400 a. metering
1 cur. trans. per phase 500 a. tripping
Res. disc. sw.
2 pot. trans. open delta
1 pot. trans. only
Temporary Connection
Gen. No.4
Gen. No.3
Gen. No.2
Gen. No.1
13 kv. feeder
132 kv. feeder
Step up trans. 13200/132000 V. 45000 kva. bank
1500 a C.T.
3000 a C.T.
Neutral bus
Ho. trans. 13200/2300 v. 1500 kva. bank
Note ⑧
Units Nos. 5, 6, 7 and 8 Unit No. 5 same as unit No. 1
* Unit No. 6 will have syn. bus section breaker on west instead of east end.
** Unit No. 7 will have transfer bus section breaker on east instead of west end.
1 C.T. 500 A. for alarm
Grounding resistor No. 2
Grounding resistor No. 1
Ground bus

WIRING DIAGRAM OF 13-KV. CIRCUITS



SECTION SHOWING CIRCULATION AND HOTWELL PUMPS

The turbines exhaust into 42,000-sq.ft. surface condensers of the single-pass type, which are rigidly connected to the turbine casing and spring supported. Each condenser is served by a two-stage steam air ejector, two 840-g.p.m. condensate pumps and two 43,500-g.p.m. circulating pumps. Normal operation of these pumps will be by motors, but one pump of each type is equipped for dual steam-turbine or motor drive. The circulating water lines are fitted with 36-in. hydraulically operated gates, arranged for remote control.

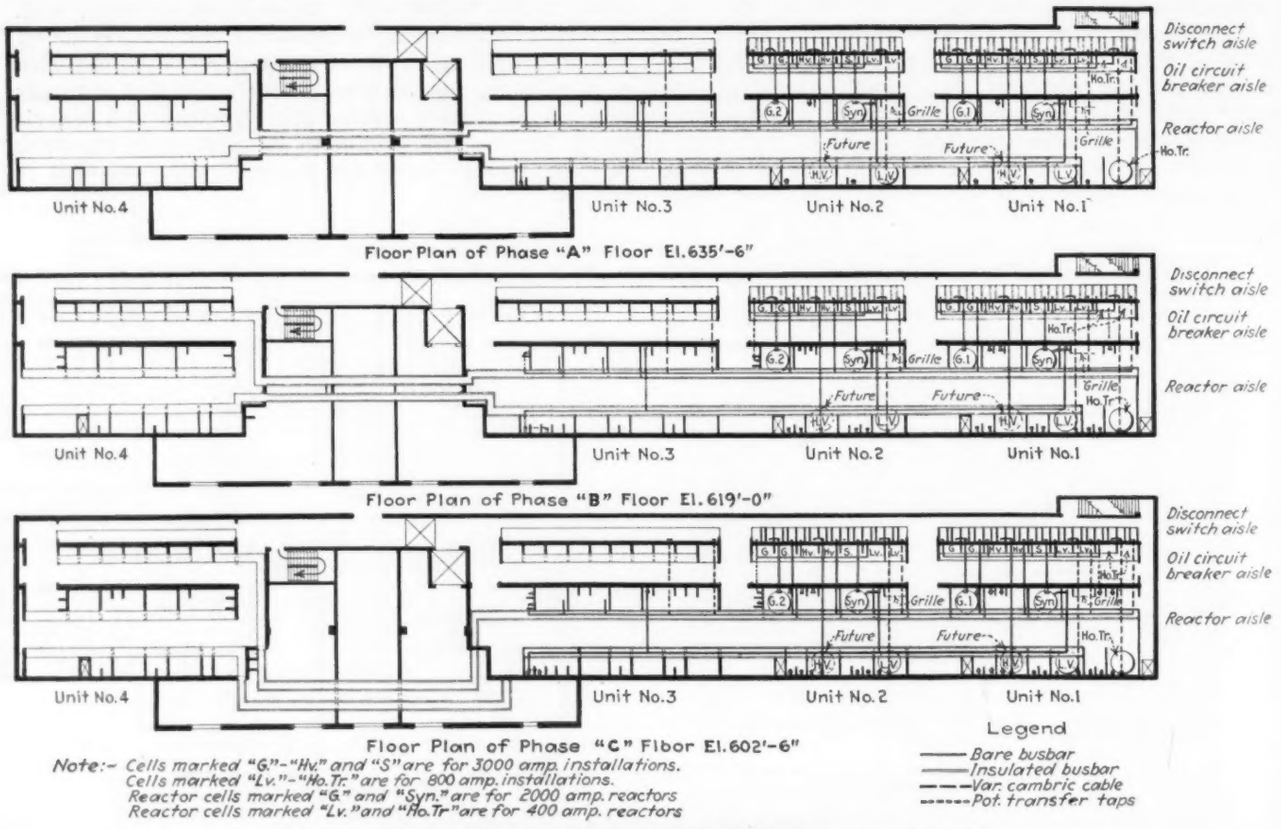
Ultimate full-load operation will require 420,000 g.p.m. of circulating water, which necessitated the construction of an intake and settling basin 600 ft. wide and extending 700 ft. out into the lake, dredged to an average depth of 15 ft. The masonry inclosing this basin is constructed principally of sandstone blocks with a limestone core and required approximately 76,000 tons of material.

As the circulating water is drawn to the condensers it first passes a set of stationary trash racks into three 22-ft. revolving water screens, thence 309 ft. through a 17-ft. diameter underground tunnel to the distributing canal which runs under and parallels the turbine room basement. Branch connections from this canal supply the intake wells for each group of circulating pumps. After passing through the condensers the circulating water is returned to the lake in a 14-ft. wide by 15-ft. high discharge tunnel, which is arranged on the opposite side of the basement from the intake canal and runs the entire length of the room. In winter part of the discharge water will be diverted, through a bypass connection, to the intake basin for the prevention of ice formation in front of the water screens.

Piping.—Main steam piping is so arranged that two boilers and one turbine constitute a unit. As may be noted from the piping plan, each pair of boilers is connected to one common steam header, running parallel to the turbine room, so that the boilers of one group can serve the turbine of the opposite unit.

All high-pressure steam and water piping consists of seamless steel tubing, equipped with cast-steel valves, fittings and Van Stone flanges. All lines are of ample capacity, being designed for a maximum steam velocity of 9,000 ft. per minute. Lines carrying high temperature steam are insulated with 1½ in. of high temperature and 2½ in. of sponge felt covering. Boiler and turbine main stop valves are equipped for motor operation, and can be controlled locally or from a remote section of the plant.

Auxiliaries.—Normally all auxiliaries are motor operated with the exception of the boiler-feed pumps. However, additional reliability is provided in dual-driven condensate and circulating pumps and direct-current generator sets, together with one turbine-driven service water pump. Current for the electric auxiliaries



Note:- Cells marked "G."-"Hv." and "S" are for 3000 amp. installations.
Cells marked "Lv."-"Ho.Tr." are for 800 amp. installations.
Reactor cells marked "G." and "Syn." are for 2000 amp. reactors
Reactor cells marked "Lv." and "Ho.Tr" are for 400 amp. reactors

PLAN OF PHASE FLOORS IN SWITCH HOUSE, SHOWING LOCATION OF LEADS

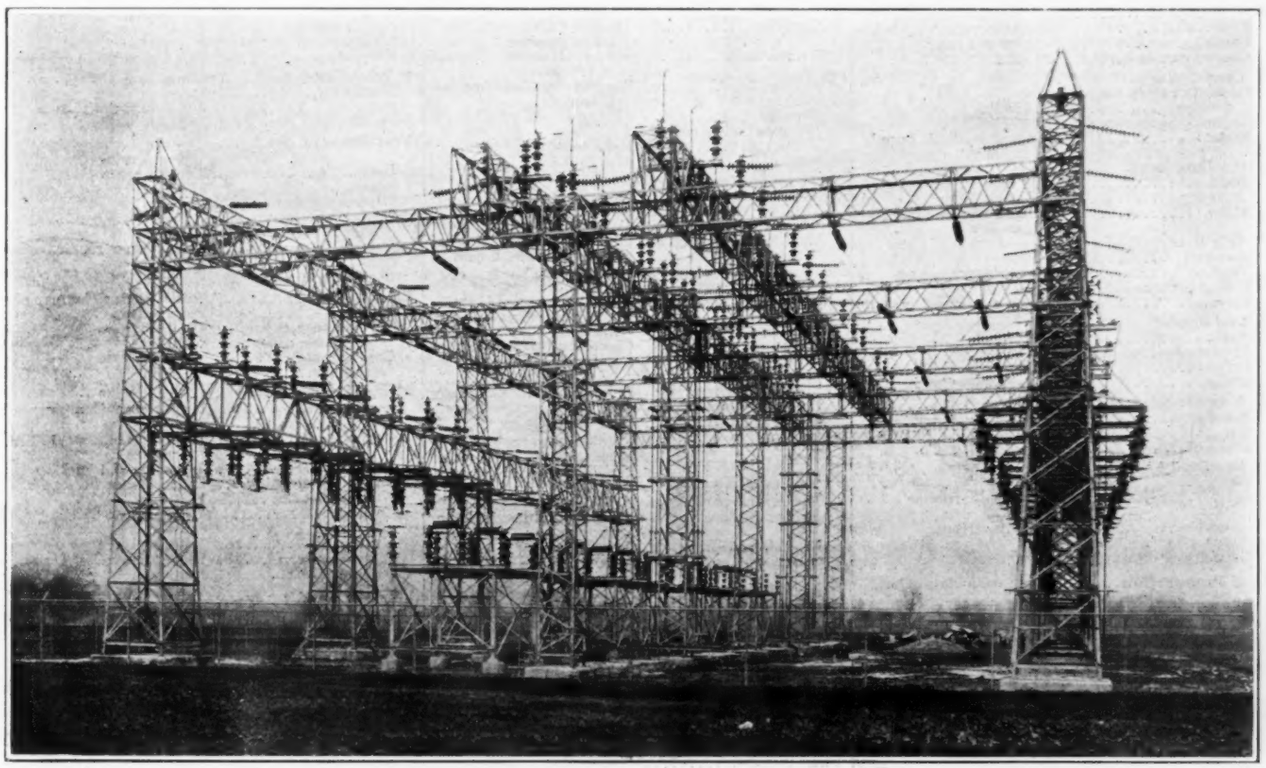
is obtained from the main generators through house service transformers.

A list of principal motor-driven equipment, with certain important data, such as horsepower, speed, etc., is given in Table I. All induction motors are designed for across-the-line starting.

Electrical Features.—The electrical switching equipment is of the vertical isolated phase type, as shown in the one-line diagram of the main 13,200-volt connections. Each 35,000-kw., 43,750-kva., 80 per cent power factor, 13,200-volt generator is connected to a main and transfer bus through a pair of selector breakers (F.H.D.-17 of 37,500-amp. interrupting capacity at 13,200 volts), a 2,000-amp. 5 per cent reactor being inserted in each lead between generator and breaker junction. Each outgoing circuit is similarly connected to these two buses, those used for house supply being protected by 400-amp., 3 per cent reactors and those for transmission circuits by the inherent reaction of the transformers through which the voltage is stepped up to 132,000 volts. A third synchronizing bus is provided, which is connected to each main bus through a similar breaker, allowing the load on the turbines to be equalized. The main buses are common to one generator and its associated feeder circuits only; the transfer and synchronizing buses are common to all units.

The design of the switch house is such that the upper story of the central (office) section is the main control room, from which all 13,200-volt equipment is operated. Immediately below this room is the conduit terminal room, which is on the same level as the oil breaker mechanism rooms, which form the upper stories of the two wings comprising the switch house proper. Below the conduit terminal room are the office floors. On either side below the mechanism floor are the phase rooms in the order *A*, *B* and *C*. These are further isolated so that each phase of each unit is housed independently of the others, there being inspection rooms on each floor between sections. The lowest phase room floor is at the turbine room level. Below this level is a mezzanine floor housing the disconnect and grounding switches for the outgoing circuits, potential transformers, generator and exciter rheostats and the control boards for the various station supply units. In the basement are located the house transformers and neutral rheostats, oil tanks for breaker and transformer oil, filters, etc.

The phase rooms are also divided longitudinally into three sections. The north section houses the disconnecting switches for the circuit breakers; the middle section, the circuit breakers and their associated short-circuiting switches and the main generator bus; and the south section, the reactors, current transformers, the transfer and the synchronizing buses.



132,000-KV. SWITCHING STATION NO. 3

Breakers of two ratings are used. For generators, ties and outgoing transmission circuits they are rated at 3,000 amp. and for house circuits at 800 amp. Disconnecting switches have corresponding ratings.

The disconnectives associated with the main breaker are six-pole, gang-operated through a hand-wheel and worm-and-gear drive. They are mechanically interlocked with the circuit breaker so that they cannot be operated unless the breaker is in the open position. The closing circuit of the breaker is also electrically interlocked with the disconnect mechanism so that the former may not be operated unless the disconnects are in the fully closed or fully open position. A further mechanical door interlock is provided so that disconnecting switch compartments, short-circuit switch compartment and circuit breaker compartment doors may not be opened unless the disconnects have been

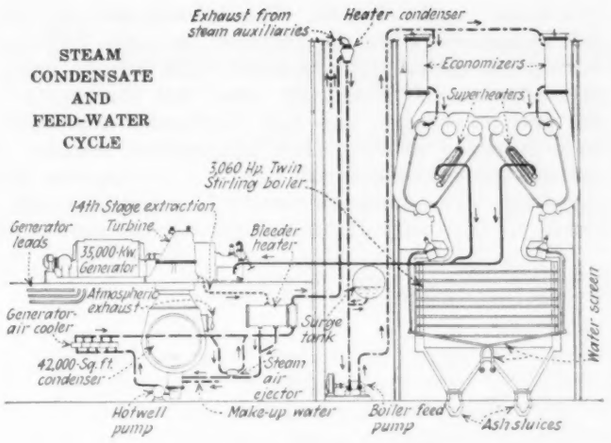
opened. Since the disconnects and circuit breakers are on opposite sides of a wall, telltales, with the word "Live," are provided on the door interlock shafts (circuit breaker side), which appear before windows in the upper cell doors when the disconnects are closed and disappear when they are opened.

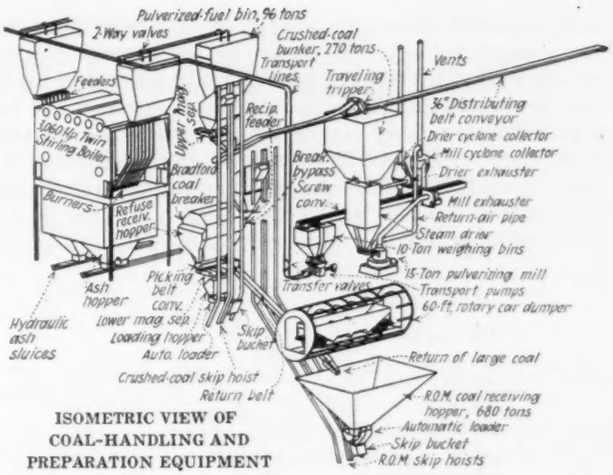
All leads passing through walls are sealed and the circuit breaker mechanisms are also gas tight. Leads are insulated where necessary so that copper fumes originating from a breakdown of a bare lead will not involve other leads. All reactors are insulated.

A ground bus protective scheme is installed, designed to clear a unit section (all three phases) in case of a breakdown to ground of a circuit breaker, short-circuiting switch, disconnecting switch, current transformer or reactor. All potential transformers are housed in cells on the floor below the C phase and taps made beyond reactors, allowing open-delta connections.

List of Mechanical Equipment in Avon Station

Coal Storage	R. H. Beaumont Company
Type machine	Skip hoist and drag scraper
Capacity	350 tons per hour
Coal Handling	Link Belt Company
Type	Car dumper and skip hoist
Capacity	250 tons per hour
Capacity track hopper	680 tons
1. *Track Scales*	
Capacity rotary car dumper	620,000 lb.
Capacity hopper dump	335,000 lb.
Make	Standard Scale & Supply Company
2. *Car Dumper*	
Size	60 ft. cars
Capacity	20 cars per hour
Make	Wellman-Seaver-Morgan Company
3. *Skip Hoists*	
Number	2
Type	Balanced—automatic
Size of buckets	100 cu.ft.
Drive	Lincoln two-speed motors
4. *Coal Breaker*	
Size	12x19 ft.
Reduces coal to	1½ in.
Drive	Belt—motor
Make	Pennsylvania Crusher Co.
5. *Magnetic Separators*	
Number	4
Size	20x36 in.
Make of pulleys	Magnetic Mfg. Co.
6. *Distributing Belt Conveyor*	
Size	36x120 in.
Belt	Six-ply, ¼-in. rubber covering
Unloader	Traveling tripper
Number bunkers served	4
Capacity of bunkers	270 tons each
Coal Preparation	Combustion Engr. Co.
Type of system	Central
Present capacity	60 tons per hour
1. *Driers*	
Arrangement	One per mill
Type	Steam heated
Drying surface	2,640 sq.ft.
Capacity exhauster fans	12,000 c.f.m.
2. *Mills and Exhausters*	
Number	4
Capacity	15 tons per hour
Type	Six roll impact
Fineness	65 per cent through 200 mesh
Make	Raymond Brothers
Type collector	Cyclone
3. *Conveyors*	
Number	2
Type	Screw
Size	16 in.
Capacity	55 tons per hour
4. *Weigh Tanks*	
Number	2
Capacity	10 tons
Scales	Fairbanks
5. *Transport Pumps*	
Number	2
Type	Screw feed
Capacity	70 tons per hour
Lines	Wrought iron
Number bunkers per boiler	2
Capacity each bunker	96 tons
Control	Bin indicators
Boilers	Babcock & Wilcox
Number	4
Type	Twin XIII.—55 Stirling
Size	30,600 sq.ft.
Steam conditions	390 lb. pressure, 725 deg. F. total temperature
Fired with	Pulverized fuel
Kind coal	Ohio No. 8
Soot blowers	Vulcan Soot Blower Co.
1. *Superheaters*	Babcock & Wilcox
Number per boiler	2
Type	Convection
Surface	3,275 sq.ft. each
Location	Between first and second bank tubes
2. *Economizers*	Power Specialty Co.
Number of boiler	2
Type	Foster steel tube
Surface	10,560 sq.ft. each
Soot blower	Diamond Power Spec. Co.
3. *Induced Draft Fans*	Buffalo Forge Company
Number fans per boiler	1
Type	Duplex conoidal, single inlet
Capacity	195,000 c.f.m.—6-in. H_2O static pressure
Drive	300-hp. General Electric B.T.S. motor
4. *Stacks*	Wiederholdt Construction Company
Number	1
Number boilers served	2
Type	Reinforced tile concrete
Size	17x175 ft.
5. *Boiler and Furnace Settings*	
Type arch	Detrick
Type furnace	Air cooled, Detrick suspension type
Type boiler setting	23-ft. wall, consisting of No. 1 and No. 2 quality firebrick
Furnace volume	30,600 cu.ft.
Firebrick furnished by	U.S. Refractories Corp. A. P. Green Firebrick Co. Walsh Fire Clay Prod. Co. Cleveland Builders Supply & Brick Company
Insulating brick furnished by	Celite Products Company
Refractory bond	J. A. Faulkner Company
Constructed by	Rust Engineering Co.
6. *Firing*	Combustion Engr. Corp.
Type	Vertical, two sides with pulverized fuel
No. burners per side	8, fan tail
No. burners per side	8, 5-in. single type
Drive	1½-hp. variable-speed d.c. motor
No. primary air fans	2 per boiler
Capacity	11,000 C.F.M.—20-in. H_2O static pressure
Secondary air supply	Bailey hollow wall dampers
Combustion control	Bailey Meter Company
7. *Water Screens*	Combustion Engr. Corp.
Number, size and gage tubes	42, 4-in. No. 6 gage
Heating surface	792 sq.ft.
8. *Ash Hoppers*	Baker Dunbar Company
Type	Air cooled
Gates	Air operated
Ash handling	Hydraulic sluiceway
Feed Pumps	Lecourtenay Company
Number	3
Type	Turbo-centrifugal
Characteristics	1,250 g.p.m., 500 lb. pressure at 2,500 r.p.m.
Make turbine	Terry
Heaters	
Number open heaters	2
Type	Barometric jet condenser
Make	Worthington Pump & Machinery Corporation
Number closed heaters	2
Surface	15,000 sq.ft.
Make	Griscom-Russel
Turbo-Generators	General Electric Company
Number	2
Capacity	35,000 kw. at 80 per cent power factor
Type	17 stage impulse, 1,800 r.p.m.
Steam conditions	375 lb. gage, 700 deg. F.
Generator Air Coolers	General Electric Company
Number	1 per generator
Type	Surface
Number sections	5
Size	15,000 sq.ft.
Condensers	Worthington Pump & Machinery Corporation
Number	1 per turbine
Type	Surface, single pass
Surface	42,000 sq.ft.
Tubes furnished by	British American Tube Co.
1. *Circulating Pumps*	
Number	2 per condenser
Type	36-in. centrifugal
Capacity	43,500 g.p.m.
Drive	1 motor and 1 duplex
2. *Condensate Pumps*	
Number	2 per condenser
Type	8-in. 3-stage centrifugal
Capacity	840 g.p.m.
Drive	1 motor and 1 duplex
3. *Air Pumps*	
Number	1 per condenser
Type	Steam jet, inter and after condensers
Number stages	2
Number jets per stage	3
Capacity	30 c.f.m at 29-in. vacuum
4. *Intake Screens*	Chain Belt Company
Number	3
Size	9-ft. 9-in. x 22-ft. 6 -in.
Speed	10-ft. per minute
Traveling Cranes	Cleveland Crane & Engineering Company
Use	Turbine room
Span	97-ft.
Capacity, main hook	125 tons
Capacity, auxiliary hook	15 tons
Use	Transformer repair house
Span	35-ft.
Capacity	75 tons
Elevators	Otis Elevator Company
Type	Push button
Switch house, capacity	4,000 lb.
Boiler room, capacity	6,000 lb.
Coal preparation house, capacity	2,500 lb.
Miscellaneous Pumps	
Service water	Lecourtenay Company
Number	3
Capacity	1,500 g.p.m. at 100-lb. pressure
Drive	2 motor and 1 turbine
Condenser cleaning	Union Steam Pump Co.
Number	1
Capacity	500 g.p.m. at 350-lb. pressure
Drive	150-hp. motor
Screen house	Lecourtenay Company
Number	1
Capacity	500 g.p.m. at 100-lb. pressure
Drive	50-hp. motor
Air Compressors	Sullivan Machinery Co.
Number	2
Type	Angle compound
Capacity	965 c.f.m. at 100-lb. pressure
Drive	Belted motor
Valves	
Boiler non-return	Foster Engineering Co.
Blow-off	Yarnall Waring Company
Hydraulic circulating	Chapman Valve Mfg. Co.
Strainers for house pumps	Elliott Company
High-pressure gate	Chapman Valve Mfg. Co. Pittsburgh Valve & Foundry Company Lunkenheimer Company Crane Company
High-pressure globe	Edward Valve & Mfg. Co. Crosby Steam Gage Co.
Standard gate and globe	Pratt & Cady Company Crane Company
Reducing	Leslie Company Foster Engineering Co.
High-pressure traps	Armstrong Machine Wks.
Low-pressure traps	Strong-Carlisle & Hammond Company
Atmospheric relief	H. S. B. W.-Cochrane Corp.
Boiler safety	Consolidated
Throttle trip	Schutte Koerting Co.
Piping	Pittsburgh Piping & Equipment Company
Pipe Covering	Johns-Manville, Inc.
Recorders and Meters	Bailey Meter Co. Foxboro Company American Schaeffer & Budenberg Company Builders Iron Foundry Co.
Thermometers	Taylor Instrument Co. American Schaeffer & Budenberg Company
Master Clock System	International Time Recording Company
General Contractor	Hunkin-Conkey Construction Company
Steel	American Bridge Co.
Steel Erection	Bass Construction Co.
Marine Work	Great Lakes Dredge & Dock Company





ISOMETRIC VIEW OF COAL-HANDLING AND PREPARATION EQUIPMENT

The phase rooms are arranged for mechanical ventilation and the ground protective relays automatically bring the fan motors from standstill or half speed (normal speed) to full speed in case of a fault developing, thereby insuring a rapid clearing of any fumes that may be generated. The fan motors are direct current, 125/250 volt, and are supplied from a bus supplied from steam-electric dual drive 250-volt generators, and a pair of 125-volt balancer sets.

The outgoing circuits are carried underground in Kerite leads (four 900,000 c.m. per phase) to the outdoor step-up station, where the voltage is stepped up to 132 kv. through 45,000-kva. banks of delta-Y connected units, and the power passes through G.E. KO-39, 132-kv. breakers before reaching the line. At present there are two such circuits. An extra transformer bank and high-tension circuit breaker are provided and a transfer bus on both the low-tension and the high-tension side arranged so that any generator or line may be connected to the spare bank and breakers. The outgoing high-tension circuits are No. 4/0 copper, two circuits per tower line.

Station power is supplied from two banks of three transformers 13,200 to 2,300 volts. They are self-cooled and water cooled, having a rating of 4,500 kva. per bank self-cooled, and 7,500 kva. per bank water cooled. Thermal relays will automatically turn on the water as required. This 2,300-volt supply will be used for all 2,300-volt motors and motor-generator sets and will also be further stepped down to 440 volts, three phase, for small motor service and to single-phase 122/244-volt supply for lighting. Emergency lighting will be handled on special circuits, normally fed from 60-cycle supply, but which will automatically throw over to

List of Electrical Equipment in Avon Station

General.—Present installation, 70,000-kw. capacity.

Generators, two 35,000-kw., 0.8 power factor, 43,750-kva., 60-cycle, 13,200-volt, three-phase, General Electric units, with direct-connected exciters.

Outgoing feeders, two 45,000-kva., 60-cycle, 132,000-volt, three-phase circuits.

Station feeders, two 7,500-kva., 60-cycle, 13,200-volt, three-phase circuits.

Main Oil Circuit Breakers.—Ten General Electric Company F.H.D.-17 motor-operated O.C. breakers with 3,000-amp. short-circuiting switches, 15,000-volt rating. Rupturing capacity, 32,000 amp. at 15,000 volts, 840,000 kva.

Six as above with 800-amp. short-circuiting switches.

Three General Electric Company KO-39, 400-amp., 132,000-volt. Rupturing capacity, 5,500 amp. at 132,000 volts, 1,250,000 kva.

Neutral and Grounding Circuit Breakers.—Four Condit Electric & Manufacturing Company 1,200-amp., 15,000-volt, single-pole non-automatic solenoid-operated breakers.

Station Power Oil Circuit Breakers.—Main 2,300-volt board, General Electric Company truck type.

Transformer and tie panels, Type F-K-53-B, 2,000-amp., 15,000-volt rating, solenoid operated.

Feeder panels, F-K-R-132-B, 600 amp., 15,000-volt rating, manually operated.

Combustion control board, General Electric truck type.

Incoming line panels, Type F-K-R-35, 600 amp., 7,500 volt, solenoid operated.

Feeder panels, Type F-K-R-35, 400 amp., 7,500 volt, solenoid operated.

Fuel preparation board, General Electric truck type.

Incoming line panels, Type F-K-R-35, 600 amp., 7,500 volt, manually operated.

Feeder panels, Type F-K-R-35, 400 amp., 7,500 volt, manually operated.

440-volt station service board, General Electric truck type.

Incoming line panels, Type F-K-R-35, 600 amp., 4,500 volt, manually operated.

Feeder panels, Type F-K-R-35, 600 amp., 4,500 volt, manually operated.

Motor-Generator Sets.—One 300-kw. dual drive Terry turbine, Allis-Chalmers 2,300 volt alternating-current to 250 volt direct-current.

One 150-kw. dual drive Terry turbine, Allis-Chalmers 2,300 volt alternating-current to 250 volt direct-current.

One 150-kw. motor drive Allis-Chalmers 2,300 volt alternating-current to 250 volt direct-current.

Two 12½-kw. balancer sets, General Electric 125/250-volt direct-current.

For reserve excitation, fuel feeder motors, elevators, switch house ventilation and emergency lighting.

Two 12½-kw. motor drive, General Electric, 440 volt alternating-current to 125 volt direct-current.

For direct-current control supply.

Transformers.

Main transmission supply:

Three banks, each consisting of three 15,000-kva., 13,200 to 132,000-volt transformers, self-cooled.

Two General Electric, one Allis-Chalmers.

Main house supply:

Two banks, each consisting of three 1,500/2,500-kva., 13,200 to 2,300-volt transformers, self-cooled and water-cooled. Thermal control of water supply, General Electric Company.

440-volt house supply:

Two 450-kva., 2,300 to 4,600-volt, three-phase transformers self-cooled, General Electric Company.

Lighting transformers:

Two 300-kva., 2,300 to 112/244, one-phase transformers, self-cooled, General Electric Company.

Main Indoor Disconnecting Switches.—Practically all simultaneously operated by manual mechanisms in gangs of two, three or six. Capacities per pole, 3,000, 1,200, 800 or 300 amp. Electric Power Equipment Corporation.

Potential Transformer Disconnects.—General Electric resistance type.

Outdoor Disconnect, Load Break and Grounding Switches.—13,200-volt transfer switches, 3,000-amp., gang-operated. All 132,000-volt, 400-amp., gang-operated. Railway & Industrial Engineering Company.

Main Current Transformers.—Single-turn primary, 3,000, 2,400, 500 and 400 amp. capacity, 15,000-volt. General Electric.

Main Potential Transformers.—Oil insulated, 13,200 to 110-volt ratio for open delta connection.

Storage Batteries.—Two Electric Storage Battery Company Exide F-25, 60 cells each, 480 amp.-hr. capacity.

Reactance Coils.—For generators and bus ties, 2,000 amp., 5 per cent.

For house transformers, 400 amp., 3 per cent. All asbestos-insulated wire cast in concrete type. General Electric Company.

Main Generator Bench Board.—Initial section, three generator panels, one sectionalizing panel, two panels equipped complete. General Electric Company.

Main Feeder Board.—Vertical type, eight panels equipped for control of two transmission circuits, one spare high-tension breaker, three house circuits. General Electric Company.

Truck Boards.—Main board, 28 truck panels, General Electric Company.

Fuel combustion board, ten truck panels, General Electric Company.

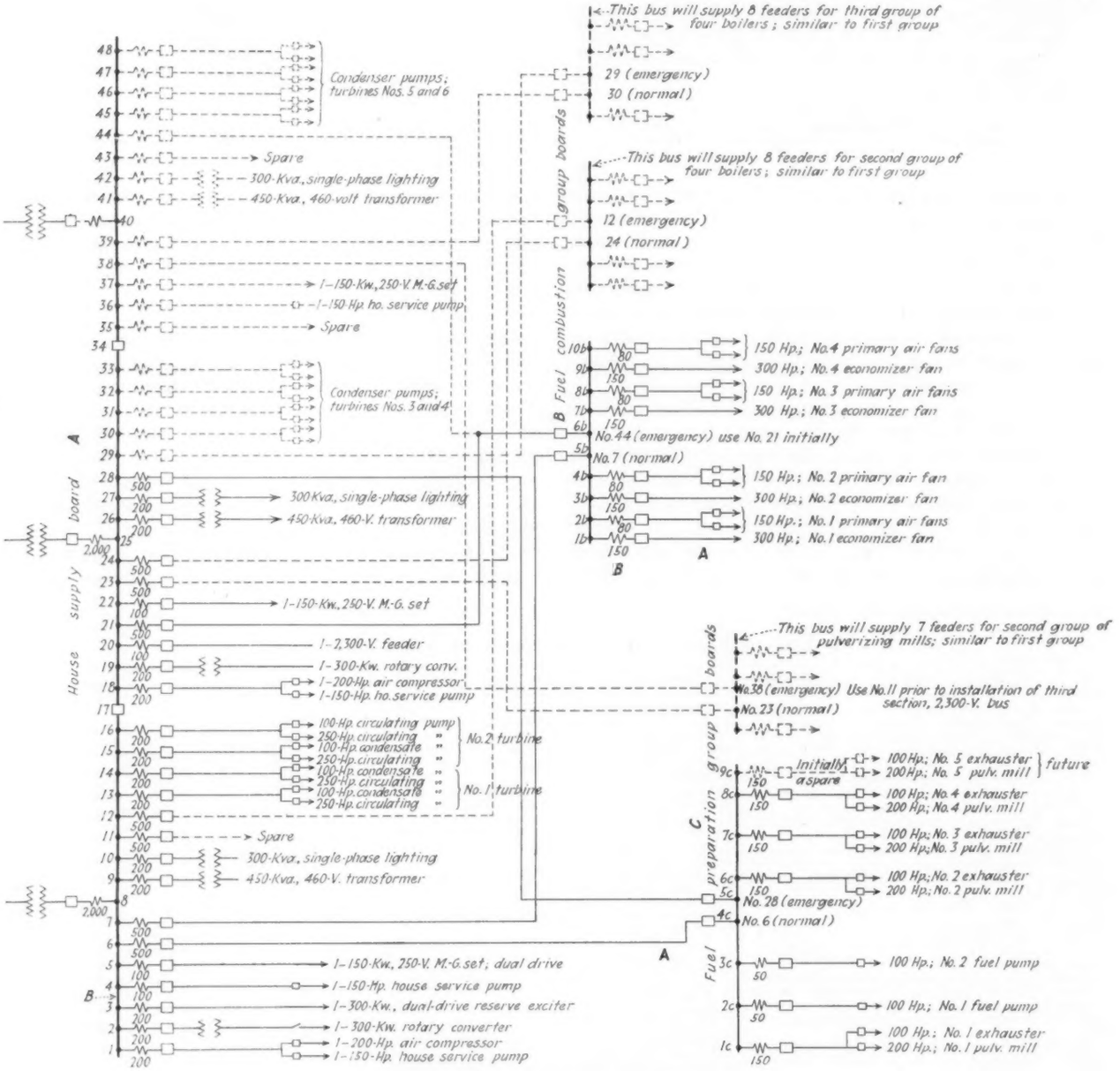
440-volt board, eighteen truck panels, General Electric Company.

Direct-Current and Lighting Boards.—Built by Leonard Electric Company, Cleveland. Breakers, I.T.E. Cutter Electric & Manufacturing Company.

High-Tension Testing Transformers.—100 kva., 0 to 30,000 volt, 60 cycle, transformer with 100 per cent range induction regulator and control panel. Truck mounted. General Electric Company.

Neutral Resistors.—Two 3 ohms each, one minute rating, 1,200 amp. General Electric Company.

direct-current three-wire supply on failure of alternating-current voltage, the steam prime movers picking up the direct-current generator loads when the alternating-current supply fails. Provision is also made for a reduced emergency supply at 120 volts direct current from the two Exide F-25 storage batteries floating on the control bus in case of simultaneous failure of both alternating current and steam supply. This latter throw-over is manual under the immediate control of


This bus will supply 8 feeders for third group of four boilers; similar to first group
29 (emergency)
30 (normal)
This bus will supply 8 feeders for second group of four boilers; similar to first group
12 (emergency)
24 (normal)
Fuel combustion group boards
B
A
150 Hp.; No. 4 primary air fans
300 Hp.; No. 4 economizer fan
150 Hp.; No. 3 primary air fans
300 Hp.; No. 3 economizer fan
No. 44 (emergency) use No. 21 initially
No. 7 (normal)
150 Hp.; No. 2 primary air fan
300 Hp.; No. 2 economizer fan
150 Hp.; No. 1 primary air fans
300 Hp.; No. 1 economizer fan
Condenser pumps; turbines Nos. 5 and 6
Spare
300-Kva., single-phase lighting
450-Kva., 460-volt transformer
1-150-Kw., 250-V. M.-G. set
1-150-Hp. ho. service pump
Spare
Condenser pumps; turbines Nos. 3 and 4
House supply board
A
300 Kva., single-phase lighting
450-Kva., 460-V. transformer
1-150-Kw., 250-V. M.-G. set
1-2,300-V. feeder
1-300-Kw. rotary conv.
1-200-Hp. air compressor
1-150-Hp. ho. service pump
100-Hp. circulating pump
250-Hp. circulating "
100-Hp. condensate "
250-Hp. circulating "
No. 2 turbine
100-Hp. condensate "
250-Hp. circulating "
100-Hp. condensate "
250-Hp. circulating "
No. 1 turbine
Spare
300-Kva., single-phase lighting
450-Kva., 460-V. transformer
1-150-Kw., 250-V. M.-G. set; dual drive
1-150-Hp. house service pump
1-300-Kw., dual-drive reserve exciter
1-300-Kw. rotary converter
1-200-Hp. air compressor
1-150-Hp. house service pump
B
This bus will supply 7 feeders for second group of pulverizing mills; similar to first group
No. 38 (emergency) Use No. 11 prior to installation of third section, 2,300-V. bus
No. 23 (normal)
C preparation group boards
Initially a spare
100 Hp.; No. 5 exhauster
200 Hp.; No. 5 pulv. mill
future
100 Hp.; No. 4 exhauster
200 Hp.; No. 4 pulv. mill
100 Hp.; No. 3 exhauster
200 Hp.; No. 3 pulv. mill
100 Hp.; No. 2 exhauster
200 Hp.; No. 2 pulv. mill
No. 28 (emergency)
No. 6 (normal)
A
Fuel
100 Hp.; No. 2 fuel pump
100 Hp.; No. 1 fuel pump
100 Hp.; No. 1 exhauster
200 Hp.; No. 1 pulv. mill

WIRING DIAGRAM FOR 2,300-VOLT HOUSE SUPPLY

the chief station operator. The control supply is fed from two 12½-kw. motor-generator sets and the two batteries referred to above, both of which will ordinarily be floating on the control bus.

The house transformers feed the main 2,300-volt truck-type board, which in turn supplies the 2,300-volt turbine auxiliaries and the secondary 2,300-volt boards known as fuel combustion and fuel preparation boards. The general arrangement of present and future connections are shown in the wiring diagram of the 2,300-volt house supply circuits. The 440-volt and 122/244-volt transformers are also fed from the main 2,300-volt board, and their output is distributed through appropriate means. It should be noted that the supply to the fuel preparation and fuel combustion boards has been arranged to come from independent sections of the main board, which will normally be operated sectionalized. The duplicate sources of supply are interlocked so that with failure of the normal source the emergency source can be closed only after opening the breaker on the receiving end of the dead circuit. This permits the operators of these boards, which are located in the boiler room, immediately to restore the power supply independently of the operator in charge of the main 2,300-volt board.

In the electrical design of this plant the aim has been to secure safety with simplicity and in so far as possible to keep all of the electrical apparatus in one building.

Economies of System Interconnection

A Few Examples of Interconnection in the Electric Light and Power Industry Reduced to the Dollars and Cents Results

By HAROLD V. BOZELL
Of Bonbright & Company, Inc., New York City

ONE of the most conclusive arguments in support of the policy of interconnection in the electric light and power industry is that interconnection saves money. This is no novel statement to an audience in the electrical industry; but when one seeks to present examples giving definite dollars-and-cents statements of the economic results of interconnection, he finds the literature on the subject remarkably scant.

The investing public—as differentiated from the speculating public—is imbued with an inquisitiveness that would surprise most electric light and power men. To understand the economic advantage of a bulk-power transmission line bringing large blocks of power from such generating centers as Big Creek or Pit River to their respective consuming loads is not difficult. It is not difficult to understand the advantage of interconnection to supply a breakdown service, whether it be actual physical breakdown or total lack of water in a hydro-electric system. However, when the subjects of integrated load curves, reserve equipment and investment economy are brought up, the specific advantage is not so apparent to the average layman, and he is much more easily convinced if the results can be shown in dollars and cents. His inquisitiveness, no doubt, is no more searching than that of the average light and power executive when the latter is asked by his engineering staff to approve an expenditure of considerable magnitude to make an interconnection or when he must subsequently be satisfied with the economic result obtained by the interconnection after it has been effected. In such cases the definite results, although not considered confidential, are nevertheless usually known to only a limited number of people. Thus the investing public, and as a matter of fact very largely the electric light and power personnel itself, has assurance only in generalities and in theory that interconnection is of economic as well as strategic advantage.

The accompanying collection of a few typical examples of interconnection in which it is possible to segregate and measure definite economic results has been made possible through the co-operation of companies operating these interconnections. It is immediately apparent from a study of any such collection that it is possible to reduce many of the results to an actual dollars-and-cents basis and in other cases to a definite and conclusive economic benefit. Analysis of the large number of cases collected from which these typical examples are quoted indicates at least six general classes of interconnection, as differentiated from transmission, economy:

1. Reserve generating equipment kept to a minimum.
2. Territorial power shortage avoided, when water is low.
3. Fuel saved in steam-power plants due to utilization of surplus hydro power during peak water season.
4. Shift of generating center made to meet wide system load center for base loads.
5. Total generating equipment reduced to a minimum by general integration of load curves of neighboring companies.
6. Necessary reserve equipment in steam-electric stations used to supply hydro systems of varying water supply.

A totally different kind of resultant economic benefit is found in cases where electric service is made available by branches from lines of interconnection to communities theretofore unserved.

Such a limited number of examples cannot show every kind of economy. They are all, as is immediately appreciated, more or less simple examples of interconnection. Much more intricate systems of interconnection could be cited, with the resultant economy of long distance relay, as differentiated from transmission, of energy. There is also the type of system, examples of which are increasing in number, in which operation is centered in one system operator, with economies easy to explain within the industry.

Effect of Interconnection on Rates

It is not the purpose of this present discussion to enter into an analysis of resulting rates. That subject is one that will automatically take care of itself. It is well known within the industry that interconnection has had an effect on rates in two directions: (1) It has been a most potent factor in maintaining electric light and power rates at their remarkably low average level in spite of increasing costs of material and labor and at the same time has benefited the companies in increased volume of business; and (2) it has made reduction of rates possible in innumerable cases in which small communities have been brought into large systems and have gained the rates of the interconnected system rather than those of the isolated plant. The question of rates between companies—that is, interconnection contracts—is of prime importance and is a major study in itself. It is to be expected that profit from the economy will inure to both parties. But it is not too much to expect that the company exercising the maximum initiative whereby the economies are made possible should benefit to the greater extent.

In any case, what the industry is doing in interconnection should be told effectively and simply to the public —customer and investor. Examples such as those quoted may assist:

CASE 1

A net saving of more than $500,000 *in plant investment and* $4,000 *a week in coal.*

In New England territory two steam-power systems had need of additional capacity. A nearby hydro-electric sys-

tem had surplus water going to waste over its dam. The two steam systems, instead of spending $1,000,000 or more to increase their individual generating capacities, invested $500,000 in a transmission line connecting with the hydro plant. The resultant saving to the steam plants was made up of two elements: First, interest on the investment in the transmission line was $25,000 less each year than it would have been on the investment in new generating capacity. Second, the steam stations took from the water-power system mainly power which it was to the interest of that company to dispose of at a very low rate. To generate its equivalent in a steam station would have meant, among other operating expenses, an outlay of more than $200,000 a year for coal.

CASE 2

An investment of less than $25,000 *saves power worth more than* $100,000 *annually.*

Two hydro-electric companies, the first operating two stations aggregating 11,000 kw. and the second operating three stations aggregating 19,000 kw., had their power plants on the same stream. The load curves—that is, the fluctuation of demand for power during the day—differed considerably on the two systems. They were interconnected through a 6,000-kva. tie-in transformer. The load carried by this transformer during the four years following its installation averaged 3,000 kva., representing water that would otherwise have gone to waste, at an annual saving of probably more than $100,000.

CASE 3

An annual net saving of $60,000 *at a total cost of* $150,000.

A 12,000-kw. steam-electric station in California, using fuel oil, was interconnected with a 150.000-hp. hydro-electric system through an 80-mile wooden-pole line costing $150,000. Since the tie-in was effected, more than 25 000,000 kw.-hr. of hydro-electric energy has been transmitted annually over the line. This represents an annual net saving of $60,000 above all charges. Moreover, it means an actual economic saving of 100,000 bbl. of oil annually.

CASE 4

$1,250,000 *of reserve equipment usually idle given earning power.*

A hydro system in Connecticut at times needed additional power. A nearb-by steam-generating system had a 10,000-kw. unit lying idle. The two systems were interconnected under an agreement whereby the hydro system assumed the carrying charges on the transmission line and any extra equipment that was needed to make the 10.000-kw. unit fully usable, and, in return, had the use of this unit whenever the steam company did not have one of its regular units out of commission.

As a result, the hydro company has had steam capacity available at practically all times when it has been needed. In addition, due to the different hours at which the peaks came, other economies have been effected. The saving in capital investment to the first company was approximately $1,250,000, and the second company realized a profit on its otherwise idle investment.

CASE 5

A city of 32,000 *saved from six days of darkness and idleness.*

Interconnection between an Oklahoma electric company and the company serving Fort Smith, Ark., had hardly been effected when a tornado partly destroyed the generating plant in Fort Smith. The transmission line satisfactorily maintained service to Fort Smith while the generating plant was being repaired. If no interconnection had existed, the people of Fort Smith would no doubt have been without light and power for at least six days.

CASE 6

$4,000,000 *saved in plant investment.*

In Oklahoma in 1914 there were no transmission line interconnections. Since that time one company has tied together the properties in the state which it then owned, as well as other properties which it has purchased since then, and also other communities to which it sells power wholesale, with transmission lines totaling at least 300 miles in length and in this way has also made electric service available to a large number of communities previously without it.

The entire territory gets the great bulk of its power from three main generating stations. The total investment in plants and transmission line is approximately 79 per cent of what the investment would be in plants alone if the transmission interconnection did not exist and each community had its individual station. This means a direct saving in investment of approximately $4,000,000. Not only does there result the decreased fixed charges, but also the entire public served by this system has the benefit of the greater economy of the large generating stations over the smaller ones which would otherwise be serving them. That this is not theory is shown by the fact that the result of this development has been lower rates.

CASE 7

A net saving of approximately $100,000 *per annum.*

A system primarily hydro-electric found it necessary to generate about 20,000,000 kw.-hr. each year in a 5,000-kw. steam reserve station in order to supply peak demands for electrical energy. In the same district was another hydro-electric system with facilities for water storage that gave it excess capacity. The two systems were interconnected and the reserve steam station was absolutely shut down. After deducting the carrying charges on the investment in the interconnecting transmission line the first company made a net saving of approximately $100,000 per year.

CASE 8

Cleveland power meets Youngstown emergency.

During the early part of 1925 a situation developed in northeastern Ohio where a large public service company supplying a steel mill load near Youngstown became in dire need of 10,000 kw. of additional capacity. It already had a new power plant under construction, which, however, could not be finished in time to meet the emergency. A neighboring utility had transmission facilities connecting at Canton with one of the large companies having a power plant on the Ohio River, but neither of these companies had 10,000 kw. of spare capacity.

The latter company had transmission facilities connecting with Akron, which in turn had no spare capacity but which was tied in with Cleveland, where the spare capacity was available. The difficulty was overcome by constructing a short piece of 132,000-volt transmission line connecting the system of the Youngstown company with its nearest neighbor and by entering into a simple four-party agreement. Cleveland supplied the energy to the system and it was relayed to Youngstown and saved the situation.

CASE 9

$500,000 *of war plant capacity made idle by post-war depression kept busy through interconnection.*

During the war it was necessary to double the generating capacity of an interconnected property operating in Illinois and Wisconsin in order to serve a mining district. The result of post-war depression and the resumption of only normal mining conditions left the system with an excess plant capacity. Connections were made with two neighboring systems and the excess plant capacity was thereby utilized.

CASE 10

A reduction of cost of surplus power to less than one-fiftieth of 1 *cent per kilowatt-hour.*

Two adjacent systems in the Northeast have for many years exchanged power by the connection of convenient trunk lines, with an annual cost of about $3,000. The amounts of power sold have averaged 25,000,000 kw.-hr. for many years, making the connection cost between one-tenth and two-tenths of a mill per kilowatt-hour. This is, of course, an exceptional case. As this interchange is largely surplus hydro, competing with steam-generated power, the connection has been profitable to each company.

CASE 11

A saving of $1,000,000 *in investment and a large section of Wisconsin saved from power shortage.*

There is a connection between the plants of a company in Minnesota and those of a company in Wisconsin. These

two interconnected systems have approximately twice as much steam capacity as hydro-electric. Due to the interconnection and to diversity in time of peak load demand on the two systems, the hydro-electric plants are used to carry these peak loads, thereby saving added investment that would ordinarily be required in steam capacity. During the low-water year of 1925 this connection was most beneficial to the people of Wisconsin, as it allowed steam-generated energy to be transmitted to Wisconsin. In fact, the papers of the state were strong in praise of this connection. In one paper the definite statement was made that the company in Minnesota furnished a graphic example of how power companies foresaw and provided for a shortage of electric energy due to low-water conditions and thereby enabled the industries of Wisconsin to continue in unhampered operation.

CASE 12

A net saving of $515,000 *in investment and an additional* 2,000 *kw. capacity made available.*

In Oklahoma three medium-sized stations—the first 4,200 kw., the second 1,000 kw. and the third 1,000 kw.—all needed additional capacity to take care of load demands in their immediate territory and at the same time to provide sufficient emergency reserve. Good engineering dictated a 5,000-kw. unit in the first plant, a 1,000-kw. unit in the second and a 1,000-kw. unit in the third. This would have cost about $875,000 for the 7,000-kw. The peak loads came at different times on these three plants. By tying them together with a transmission line the resulting composite load curve made it possible for the system as a whole to take on an additional load of 2,000 kw., still leaving ample provision for emergency reserve. The cost of this interconnection—90 miles—was $360,000.

CASE 13

Immeasurable loss in income to a community and $300,000 *loss of revenue to a company saved by interconnection.*

In Georgia in the summer of 1925 a hydro-electric plant of 18,000-kw. capacity found that it did not have enough water to run even the auxiliary equipment around the power house. There had just been built a 100-mile transmission line tying this plant to a combined steam and hydro system. Due to this tie-in the company was able to pull through the summer with practically no curtailment of service. Had this tie-in not existed, the company would have been unable to supply any power to its customers for a considerable period of time.

Inspection Department Analyzes Causes of Fires

RECORDS of the Chicago Department of Gas and Electricity, just made available for the year 1925, based on inspections made of all fires occurring in buildings containing electrical wires or apparatus, show some interesting facts regarding number of fires due to different electrical causes and the losses therefrom. For number of fires caused, irrespective of damage involved, causes rank in the order shown in the following table:

Cause of Fire	Number of Fires	Per Cent of All Electrical Fires	Loss Caused
Flat irons	115	28.2	$8,516
Short-circuited or grounded motor windings	39	9.6	3,030
Defective fixtures	28	6.9	1,245
Cords used as line wires	24	5.9	2,556
Wiring of Christmas trees	15	3.7	15,546
Poles and transformers	14	3.4	395
Cutout cabinet wiring	14	3.4	1,800
Service conduit wiring	14	3.4	190
Defective contacts on other than cutout cabinets and panel boards	13	3.2	782
Defective cords on appliances	13	3.2	2,425
Sparks from commutators, slip-rings or brushess	13	3.2	425
Open wiring	11	2.7	5,090
Total	313	76.8	$42,010

For loss resulting from fires developed, causes rank in the following order:

Cause of Fire	Loss	Per Cent of Total Loss from Electric Fires	Number of Fires
Fallen overhead lines	$30,025	31.7	3
Wiring of Christmas trees	15,546	16.4	15
Flat irons	8,516	9.0	115
Conduit wiring in buildings	6,010	6.3	7
Overloaded and overfused circuits	5,840	6.2	5
Grounds, short circuits and defective connections on open wires	5,090	5.4	11
Short-circuited or grounded motor windings	3,030	3.2	39
Armored cable	2,625	2.8	14
Cord used as line wire	2,556	2.7	24
Defective cords on appliances	2,425	2.6	13
Total	$81,663	86.3	246

Classified as to number of fires caused, electrical heating appliances and resistances collectively caused 137; motors, 59; cords, 49; wire in metal inclosures, 46; overhead lines, 17, and lamps, 11. Classified as to loss involved, overhead lines caused a loss of $30,420; electrical heating appliances and resistors, $11,848; wires in metal inclosures, $10,872; cords, $5,890; motors, $3,818, and lamps, $445.

The total number of fires reported as having electrical origin was 408, with a total loss of $94,690. No figures are given on the total number of fires resulting from all causes nor the total loss from such fires, to indicate the proportion of electrical fires to all fires.

Letters from Our Readers

Transformer Interior as a Resting Place

To the Editor of the ELECTRICAL WORLD:

Among the freak newspaper reports which you have printed from time to time have you noticed the inclosed clipping? This was cut from one of the Boston papers:

Oakland, Neb., was in darkness several hours after an eccentric villager had been found nestling in a big electric transformer carrying 30,000 volts. The man had crawled into the transformer cage, and his presence there caused a humming along the wires and sent repair men working near by hurrying to the scene. They shut off the current and got the man out. He was taken home. A hole had been burned in his chest, but otherwise he was not hurt. He had not come in contact with any "live" wire, but it is believed that an arc jumped through his body, burning his chest.

As a safety measure it might be suggested that such dangerous pieces of apparatus be locked up, at least at night, so that tired persons who crawl into such places to sleep may not cause unnecessary noises along transmission lines, causing overworked repair men an unnecessary amount of overtime work. It might be further suggested that the man who sleeps on top of 30,000 volts and has only a small hole burned on his chest might be examined by a competent board of physicians with a view of determining how he attained such a high degree of insulation and if it could be applied to the average lineman. Of course, the manufacturers of rubber gloves and protective guards might object to breeding a race of men with such high insulation.

Perhaps, on the other hand, the volts in Nebraska may be of the masculine gender and therefore not so deadly as the things that shock us in the East.

CHARLES E. HANNY,
Trumbull Electric Manufacturing Company, Plainville, Conn. Sales Engineer.

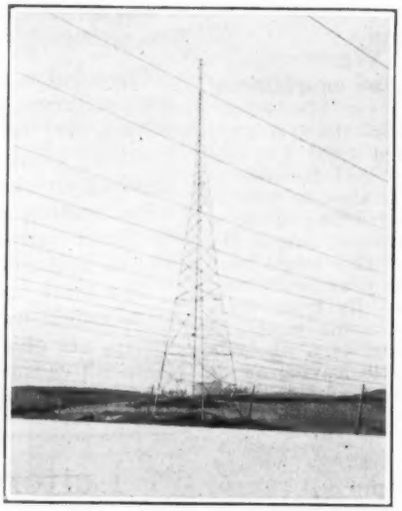
Central Station and Industrial Practice

Lightning Protection for Oil Tanks

Practical Application of Lightning Rod Principle Is Made by Southern Pacific Company to Protect 3,000,000-Bbl. Storage Tank

DISASTROUS fire losses suffered by oil companies in southern California during the spring of this year due to lightning striking oil-storage reservoirs has evoked considerable discussion and experiment as to adequate protection from this damage. On the basis of experiments conducted in the high-voltage laboratory of the General Electric Company on a model of the Southern Pacific Company's 3,000,000-bbl. concrete reservoir near Tracy, Cal., now building, it was determined to use 150-ft. grounded steel towers to take direct lightning hits, to provide grounding of all reinforcing mesh used in the concrete structure and to leave no exposed reinforcing protruding into the oil.

This reservoir consists essentially of an elliptically shaped concrete bowl approximately 600x1,200 ft. and 30 ft. deep. The roof of wood sheathing with a covering of composition slopes from the center toward the ends and sides sufficiently for drainage only. The floor of the reservoir is a 4-in. concrete slab with 6-in. woven wire reinforcing. This mesh was lapped 6 in. at the joints and thoroughly tied together. Bare stranded No. 1/0 copper cable leads brazed to this mesh are brought out every 100 ft. on the ends and every 50 ft. along the sides to permit grounding if this is found desirable. Precautions were taken so that no reinforcing will protrude into the oil,



A PROTECTIVE TOWER SEEN ACROSS THE ROOF OF A TANK. NOTE GROUNDED WEB ABOVE THE ROOF

especially on the steps carrying the wooden joists that support the roof.

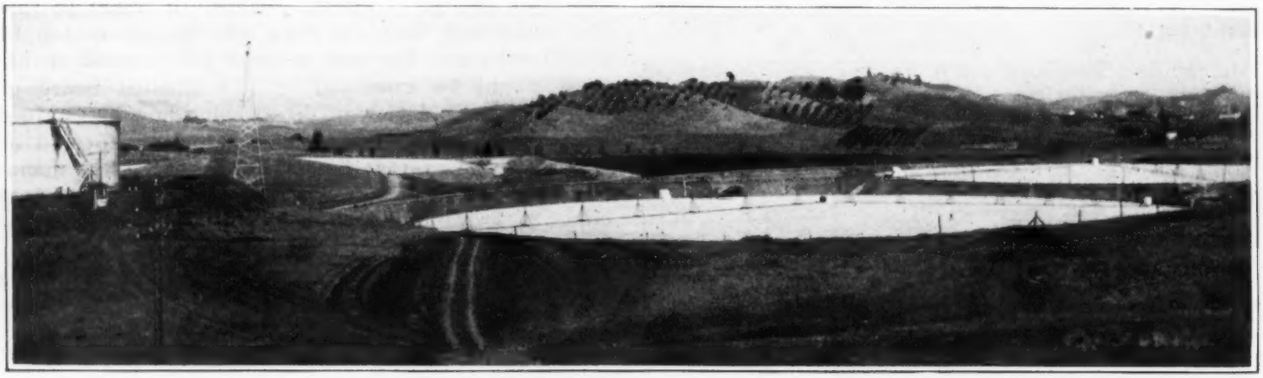
Radio type steel towers 150 ft. in height are placed 700 ft. from the center along the major axis and 400 ft. on the minor axis, which puts them in each case about 100 ft. from the edge of the tank. It was experimentally proved that the towers would take all direct hits. Each tower is grounded by means of four 20-ft. lengths of 1¼-in. pipe arranged with a strainer and drive point at the bottom and a pipe tee at the top to allow periodic moistening of the soil. The water table is about 12 to 15 ft. below the bottom of the reservoir.

It has not been definitely determined whether the reinforcing will be grounded, and tests are now under way as to the practicability of a suspended wire net between towers. The reservoir is to be used for seasonal storage and not to be drawn on daily. It is now being filled through the pipe line of the Associated Oil Company.

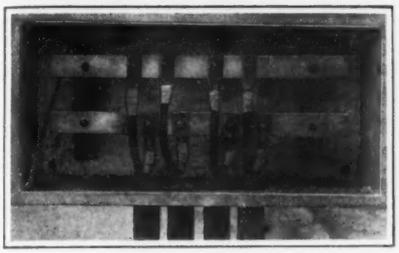
The illustrations accompanying this article are of an installation on the tank farm of the Shell Oil Company at Martinez, Cal. There are three reservoirs here, protected by five towers, one 175 ft. high and the four others 150 ft. Each tank is covered by a network of wires spaced on 3-ft. centers and suspended several feet above the roof. The network is banded around the edges with a grounded cable, which is also attached to the towers.

Direct-Current Control Bus Sectionalized

TO FACILITATE the making of repairs on control circuits it is the practice of the Alabama Power Company in many of its substations to sectionalize the control system by the arrangement shown in the accompanying illustration. In this particular illustration, at the Magella substation, the 125-volt direct-current control wires coming from the storage battery room terminate on the panel at the lower left. The three other circuits feed three sections of the outdoor substation. Thus, if trouble occurs on one of these three circuits, that circuit can be cut out by simply removing the contact bolts and the fault located



TANK FARM OF THE SHELL OIL COMPANY AT MARTINEZ



METHOD OF SECTIONALIZING CONTROL BUS USED BY THE ALABAMA POWER COMPANY

and repaired without interfering with the other sections of the substation. The sectionalizing bus is mounted on slate and then covered by a galvanized iron box with removable cover.

Aids to Correct Connection of Polyphase Meters

By Fred C. DeWeese
Louisville, Ky.

QUITE frequently representatives of utilities in small districts who are not technically familiar with metering have difficulty in connecting polyphase watt-hour meters requiring instrument transformers. Great care must be exercised to connect the potential circuits across phases so as to produce magnetic fields in the right direction. Correct rotation may be obtained, even with improper connections that cause incorrect registration. The accompanying diagrams and instructions, which were developed by the writer to aid unfamiliar workers, have been applied for several years with great satisfaction. The method is applicable regardless of whether the load power factor is below 50 per cent.

Instructions

In the Shop. — Tag the instrument transformer leads so they will be easily identified; it is advisable to tag the secondary leads of the potential transformers connected across phases *A* and *B*, the same as secondary leads of the current transformers which are connected in phase *A*. This precaution will avoid crossing phases.

Field Tests.—(1) Connect the watt-hour meter to the system as shown in Fig. 1a, inserting the potential coil of the upper element between potential transformer terminals *A* and *B*, the potential coil of the lower element being left open. (2) Change the connections of the potential coil of the upper element from *AB* to *AC*, as shown in Fig. 1b. If the power factor of the load is exactly 100 per cent, which is rarely the case, the speed of the rotating element will be the same with both connections. If the load power factor is above 50 per cent but less than 100 per cent, the speed of the rotating element will be different from that of the first connection, but the direction of the rotation will be the same. If the power factor of the load is below 50 per cent, the meter will rotate in the opposite direction.

The same method should be followed with the lower meter element, connecting first as shown in Fig. 1c and next as shown in Fig. 1d. These connections are relatively the same as those made with the upper element. What was

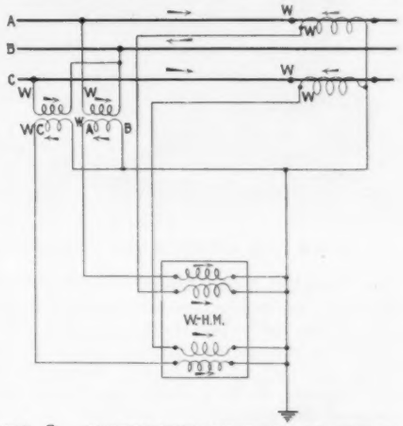


FIG. 2—ALTERNATIVE METHOD OF CHECKING WATT-HOUR METER CONNECTIONS

previously said regarding speed and direction of rotation applies here.

Final Connection. — If it is found that the power factor of the load is above 50 per cent, connect the two elements of the watt-hour meter so that either element, when operating separately, rotates the meter in the forward direction, being very careful to see that the potential coils of the upper element are connected between potential transformer leads *A* and *B*, the potential coil of the lower element between potential transformer terminals *C* and *B* and that the current coils of the upper and lower elements are connected in phases *A* and *C* respectively.

If the load power factor is found to be below 50 per cent, connect the potential coil of the lower element (when the potential coils of the two elements are connected between *AB* and *CB* respectively) so that it rotates backward when operating separately. The faster element must then be connected so as to rotate in the forward direction.

Alternative Directions

Connections (potential transformers). —(1) White primary leads of the potential transformers to the two outside primary phases; (2) black primary leads together and to the middle phase; (3) white secondary leads to the incoming or line side of the meter; (4) black secondary leads together and to the load side of the meter.

Connections (current transformers). —(1) White primary terminals of current transformers to the line side of the line; (2) black primary terminals to the load side of the line; (3) white secondary leads to the line side of the meter; (4) black secondary leads together and to the load side of meter.

Connections (General). — After the foregoing connections are all made, connect all potential and current leads on the load side of the meter together and to ground (Fig. 2). Be sure to see that

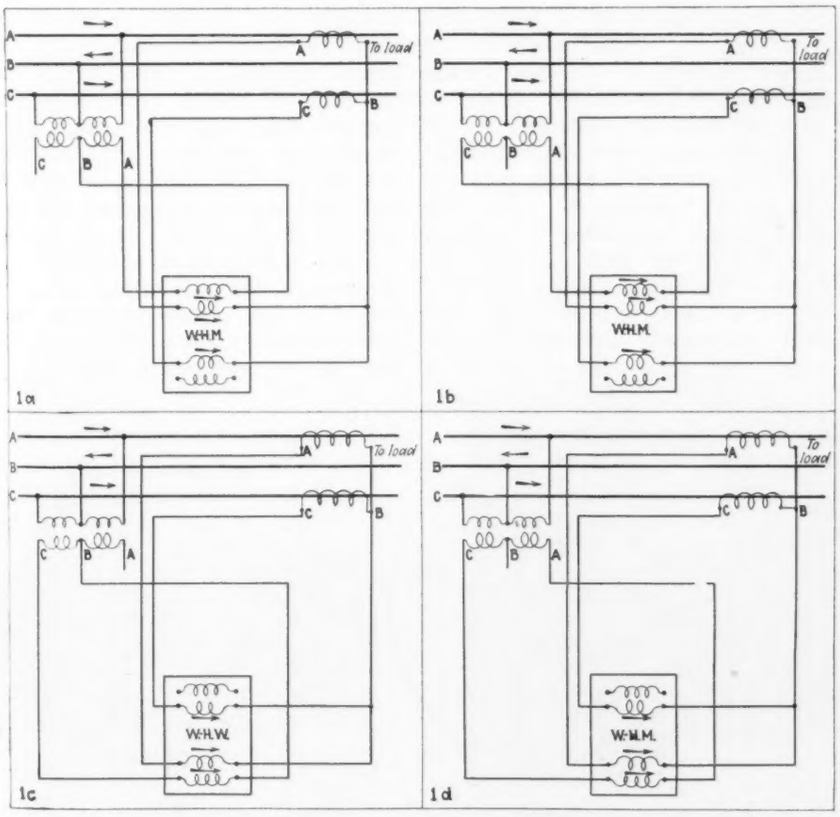
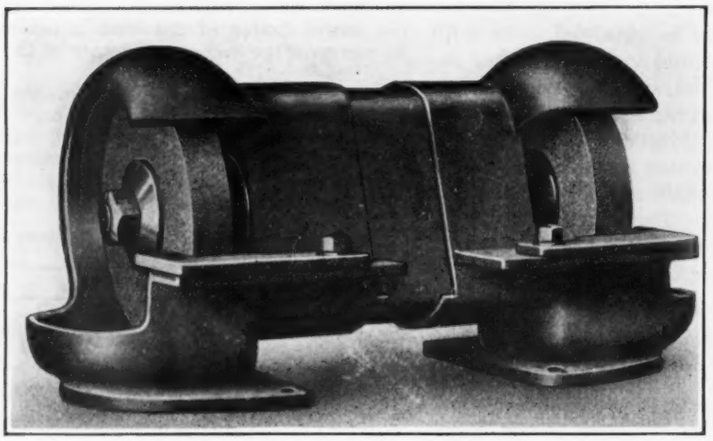


FIG. 1—CONNECTIONS FOR COMPARING WATT-HOUR METER OPERATION TO CHECK CONNECTIONS



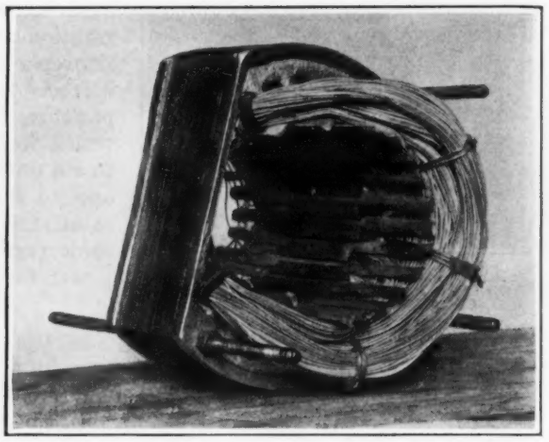


FIG. 1 (AT LEFT)—FIRST FLAT-FRONT MOTOR APPLICATION. FIG. 2 (AT RIGHT)—STATOR WINDING OF MOTOR IN FIG. 1.

the potential and current transformers that are connected to the same phases are connected to relatively the same elements in the meter. After the connections are all made, check the connections again, to be certain you have not crossed the phases.

The foregoing instructions are very easily followed, as they are very simple. The man who takes pride in being able to do this kind of work properly rarely ever makes an error in connections.

In making polyphase watt-hour meter connections, where it is necessary to use instrument transformers, the potential transformers should be connected on the line side of the meter, or, in other words, ahead of the current transformers and not on the load side. If they are connected on the load side of the current transformers, the losses in the potential transformers will flow through the current transformers and will thereby be registered on the meter.

Design Problems in Flat-Front Induction Motors

BY A. W. FORBES
Forbes & Myers, Worcester, Mass.

INDUCTION motors with the shaft close to one side of the frame are a recent introduction, but with the increasing tendency to build motors into the machinery that is driven the demand for this type seems likely to be continuous. So far as I am aware, very little has been published in regard to the design of motors with unsymmetrical windings, and a few comments on the theory of operation and the disposition of coils are therefore in order.

Fig. 1 is the first motor of this type which we built, a bench tool grinder. The advantages over the round type motor for such an application are self-evident. Fig. 6 is an application to a circular saw.

The induction type of motor must have a uniformly rotating field for satisfactory operation. The flat front makes impossible a uniform distribution of coils around the stator. The problem, therefore, is to secure a uniformly rotating field with irregularly distributed windings. This has been solved in a number of ways for different applications, two being described below.

Fig. 3 shows a theoretical distribution of the windings of the standard two-pole induction motor, with but few coils in a group so that the phases do not overlap. In practice the coils would follow the dotted lines, but to make the theory simpler they are drawn straight across. It is readily seen that there is no place where the coils can be omitted for 90 deg. of the periphery without disturbing two phases, and it is necessary to omit the coils for 90 deg. in order to make it possible to cut a substantial amount from the motor frame. To omit the coils from these 90 deg. would unbalance the phases completely. Each phase of a two-pole winding is really a single magnet with its axis at right angles to the coil. The fact that the coils actually take the shape of the dotted lines does not affect the electrical result. If we move the coils of phases *B* and *C* in the direction indicated by the arrows, the axis of the coils remains the same, straight across the center of the motor. The result of such motion is shown in Fig. 4.

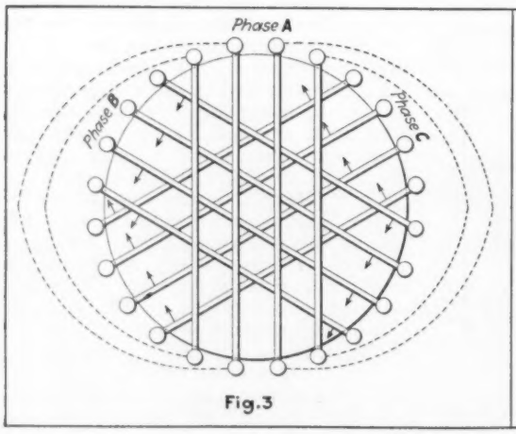


Fig.3

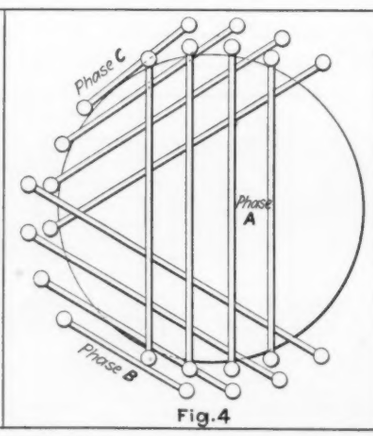


Fig.4

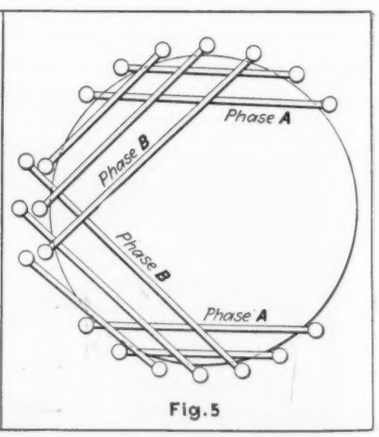


Fig.5

FIG. 3—STANDARD THREE-PHASE INDUCTION MOTOR STATOR WINDING. FIG. 4—WINDING OF FIG. 3 WITH COILS SHIFTED. FIG. 5—DIAGRAM OF TWO-PHASE, FOUR-POLE, FLAT-FRONT WINDING

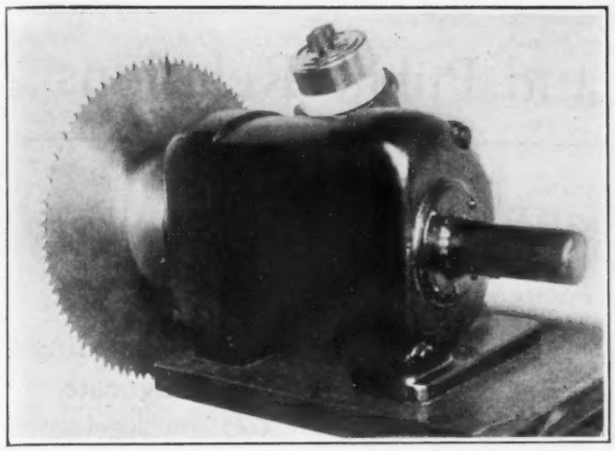


FIG. 6—FLAT-FRONT MOTOR FOR SAW DRIVE

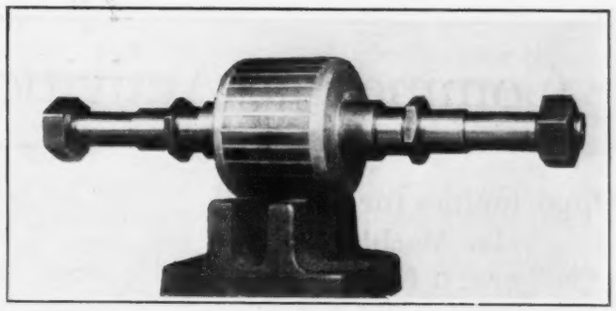


FIG. 7—DOUBLE-END ROTOR FOR MOTOR IN FIG. 6

The axis of each coil has remained in the same position, the three phases being spaced at 60 deg. around the motor. Now, if the proper number of turns is found for each of the three phases, the result is a uniformly rotating field exactly like the field of the standard induction motor. In Fig. 4 is shown a clear space of 90 deg. with no windings. As far as the theoretical conditions for normal operation are concerned the problem is solved, but there are mechanical features in arranging the coils that have to be considered, as well as electrical phenomena during the starting period that are hard to analyze.

In practice we bunch the windings of phases *B* and *C* so that a larger proportion of their turns is in the end slots next to the flat front, and we also shift the coils of phase *A* along its axis away from the flat front. The actual winding data used in the grinder illustrated in Fig. 1 are as shown in Table I. There are eighteen slots, numbered from one end next to the flat.

This winding arrangement is entirely satisfactory for an application like the grinder in Fig. 1, where high starting torque is not essential. It has one fault, however, for general application, and that is a sharply defined point at just half speed where the torque is very low. Research is now being conducted to eliminate this point of low torque without introducing worse troubles. It is easy to eliminate this point by the sacrifice of running conditions, but it is undesirable to accomplish the result in this fashion.

These winding data can be copied for other motors only where the requirements are identical except for size and voltage. Each problem requires a different treatment. I shall discuss only one other, a two-phase, four-pole motor. In this case the problem of a uniformly rotating field was solved in an entirely different manner. Fig. 5 illustrates the principle. Phase *A* has the usual standard windings for two opposite poles, but as these have the same polarity, it produces two poles of the opposite polarity between them. So phase *A* is magnetically complete. On the other hand phase *B* only has two adjacent poles. These two poles are placed in the proper phase relation to phase *A*, so that the result of the omission of the other two poles is but slight.

It is unlikely that these flat-front motors will ever be built as a standard line. Their field is distinctly one for built-in motors, to be built in the same quantities as the machines on which they are used. But although their applications are not numerous, there are places where they make a direct motor drive practical and where otherwise belts or gearing would be needed.

TABLE I—WINDING DATA USED IN THE GRINDER

Coil	Turns	Placed in Slots
	Phase *B*:	
1	10	1 and 7
2	95	1 and 8
3	40	1 and 9
4	30	2 and 9
5	75	2 and 10
6	10	2 and 11
7	35	3 and 11
8	15	3 and 12
	Phase *A*:	
1	30	2 and 13
2	75	3 and 14
3	100	4 and 15
4	75	5 and 16
5	30	6 and 17
	Phase *C*:	
1	15	7 and 16
2	35	8 and 16
3	10	8 and 17
4	75	9 and 17
5	30	10 and 17
6	40	10 and 18
7	95	11 and 18
8	10	12 and 18

Subsoiler Used for Laying Street Lighting Cable

THE cables for the new street-lighting system in St. Louis are being laid in many sections by hooking the end of the cable to a subsoiler pulled by a 5-ton tractor. The subsoiler cuts a trench about 12 in. deep through the brick sidewalks and earth, and workmen follow, tamping the broken bricks and earth into the trench. A long auger is used to drill under the pavement of cross streets.

It was possible for two men to lay 240 ft. of cable in six minutes, and because the trench was immediately refilled, danger to pedestrians was minimized. A. M. Ryckoff is the contractor carrying out the work.

SUBSOILER PULLED BY A 5-TON CATERPILLAR TRACTOR

Commercial Activities and Public Relations

Opportunities for the Small Ice Machine

BY C. C. CRAWFORD
Portland Electric Power Company, Portland, Ore.

ENTHUSIASM over the household electric refrigerator should not be permitted to cause central stations to lose sight of the very desirable and profitable load to be had from the small ice machine suitable for ice cream cabinets, soda fountains, dairies, small grocery stores, meat markets, florists, bakeries and drug stores. In this class ice cream cabinets and soda fountains furnish the best revenue, as they will average 300 kw.-hr. per month with good yearly load factor.

In the city of Portland one of the large ice cream manufacturers rents cabinets with a minimum guarantee and an extra charge per gallon for ice cream, depending upon the location, to cover the service rendered. This arrangement provides only for an ice cream cabinet. Another company manufactures and sells a combination fountain and ice cream cabinet. This cabinet furnishes four combinations of temperatures, ice cream storage at zero, ice cream-serving compartment at 10 deg. above zero, compartment for sirups, milk and water at 40 deg. above zero and a back bar or cabinet at 40 deg. above zero. The company furnishing the ice cream cabinets only now has approximately 300 of these cabinets in service in Portland and vicinity, and the latter company has in service about 50 of its combination fountain and cabinet refrigerator installations. The fact that neither company is able to meet the demands for these appliances indicates the ready desire of their customers to get away from the old method of icing and indicates a good present and potential load for the central station.

ESTIMATED MONTHLY KILOWATT-HOUR CONSUMPTION FOR SMALL ICE MACHINES

Class of Service	Motor Size, Hp.	Approx. Contents of Cooling space, Cu.-Ft.	Estimated Monthly Kw.-Hr.
Ice cream cabinet only	¼	60	200
	½	150	300
Combination ice cream cabinet and soda fountain	½	150	250
	1	250	400
Small dairy	¼	60	150
	1*	150	250
	3*	200	600
	5*	300	800
Grocery stores and meat markets	¼	40	130
	½	70	250
	1*	100	250
	2*	150	325
	3*	200	400
	5*	300	600
Florist	¼	40	100
	1*	100	200
	2*	150	300
	5*	300	500
Baker	¼	40	100
	1*	100	200
Drug store without ice cream cabinet and fountain	¼	15	60

* Ammonia compressor

The small dairy is a very good prospect, as in most cities the health department requires certain standards which the dairyman can easily meet with the small electric refrigerator. Small grocery stores and meat markets also are good prospects. The florist and baker are in the same class as the grocer from the standpoint of revenue and demand. Drug stores that do not have ice cream cabinets and soda fountains also need refrigeration for certain medicines and drugs that require dry, cold air.

The Portland Electric Power Company is actively soliciting this type of business and is co-operating in every possible way with the manufacturers of soda fountain cabinets and small ice machines. In estimating customers' bills and annual revenue to the central station the accompanying table showing the monthly kilowatt-hour consumption for different size motors on small ice machines is used.

Inducement to Correct Meter Reading

WHENEVER meter installers of the Northern States Power Company report an incorrect meter reading on leaving a meter, a notice is posted in the meter department. This notice indicates the incorrect reading reported, the correct reading reported by the person who may later make service available and the name of the installer. Because of publicity regarding their errors, the meter installers soon become very careful about reading meters, and thereby become a check-back on any one who reads the meter later.

By cross-checking the readings in this manner, it has also been possible to avoid loss in revenue or ill will of customers due to the opposite result.

Unconsciously Converting a Municipal Advocate

WHEN the term "good public relations" is mentioned, a few persons still think it merely involves telling the public through advertising what a wonderful public utility is serving them, or possibly adopting some superficial practice intended to put the public in a good frame of mind. In any event many still think that obtaining good public relations requires a large expenditure of money, whereas an expenditure of good will, not money, is chiefly needed.

Just one of many examples of how good will is created occurred in a Middle West city and came to light in a rather indirect manner. A man had just moved his family to this city and, as usual, thought of utility facilities—electricity, gas, water and telephone—last of all. By chance he applied for gas service first. It was furnished by the municipality, and on entering the municipal office the new citizen explained to a clerk that he had already installed his family and asked when he could have service. The clerk merely replied that he could record his application and would have to take his turn. "Can't you give me some idea when my turn will come—a couple of days, a week or a month?" the new customer asked. "I don't know," retorted the clerk, "there are a lot of applications ahead of yours."

Next the newcomer went to the electric company's main office, entering the front door after office hours and just as the last representative was hastening homeward. The new customer repeated his explanation and request, to which the company's representative sympathetically replied: "Can you wait until tomorrow morning? Some one can fix you up promptly then." Without waiting for a reply, he immediately added: "Where is your home? I will attend to your application." The new customer turned away satisfied. But the utility representative didn't stop

with this promise. He jumped into his car, drove to the man's home, inserted the fuses and closed the service switch. The electric service was connected when the customer arrived home.

Later the newcomer, who happened to be a new editor of the local newspaper, was talking with a business acquaintance and said that he had always been in favor of municipal ownership, but this one experience had proved to him that only private initiative will bring real service. Furthermore, this newspaper, which had previously played to its own pocketbock by trying to arouse a public grievance against the utility and then sympathizing with the public, has since said many complimentary things about the utility with results which no amount of paid advertising could produce.

This incident occurred without any knowledge on the company's part as to the identity of the man, and therefore it represents real public service, exemplifying this company's attitude in handling all public contacts. Of course, every public request could not be handled with this dispatch, but the example indicates that it is the spirit which animates the service that counts.

Artificial Skylight Illumination

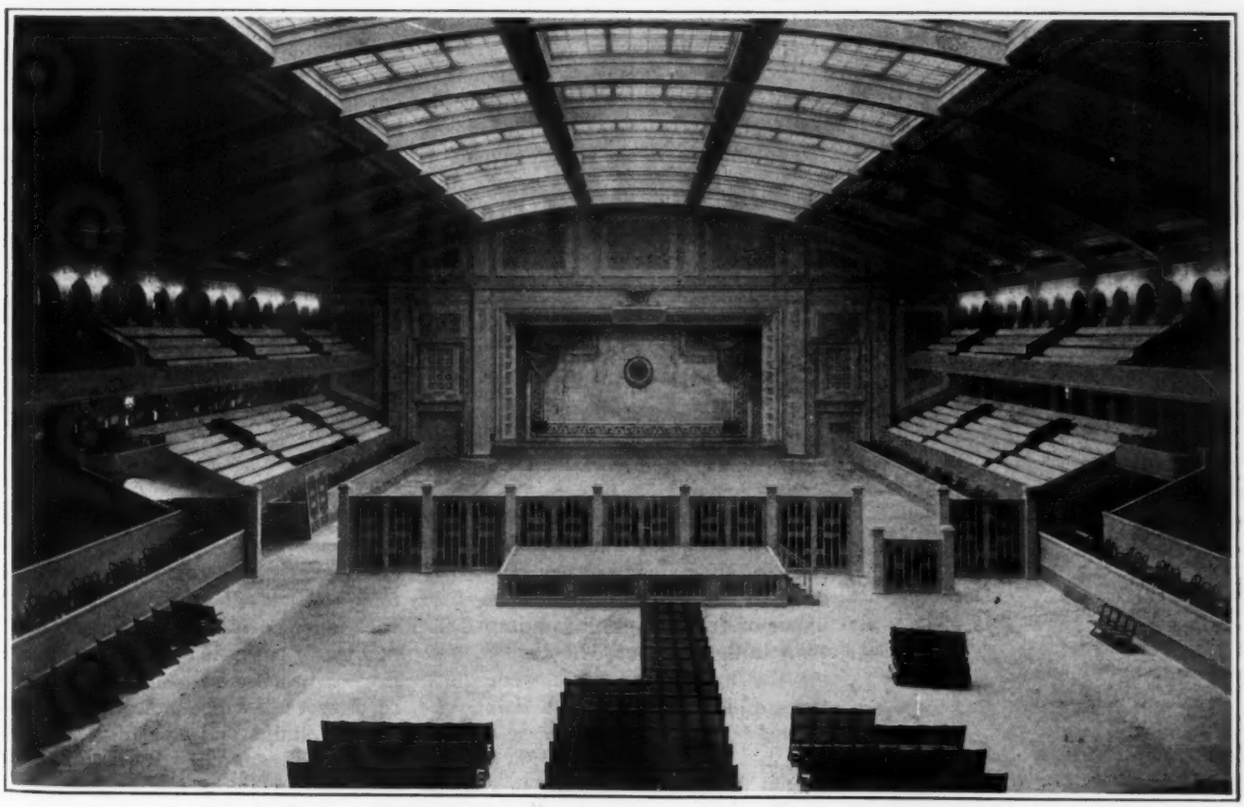
Success of Cleveland Auditorium Lighting Scheme Duplicated in Milwaukee—Concentration of Prismatic Reflectors Over Skylights Used

By DAVIS H. TUCK
Holophane Company, New York

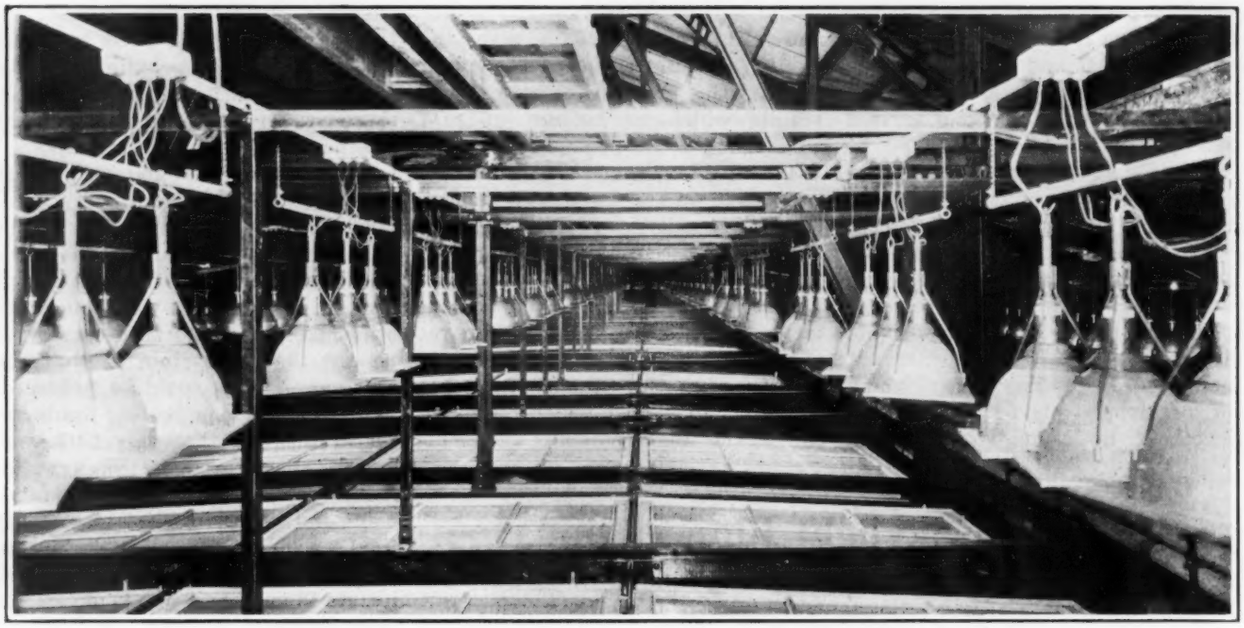
THE illumination of the Milwaukee Auditorium as originally planned consisted of three rows of bare frosted lamps arranged around a small skylight and a row of bare frosted lamps around the side walls. This was, of course, inadequate in every respect.

An attempt was made to utilize the skylight as a source of artificial illumination by placing 40 mirrored glass floodlight reflectors above the skylight and directing the light from these units toward the sides of the exhibition space, where there was an illumination intensity of less than 0.2 foot-candle. The number and size of the reflectors used were inadequate, the flood type of distribution of the mirrored glass reflectors was not correct, the skylight was too small, and, most important of all, there was no engineering study made of the problems; the attempts at artificial skylight illumination were of a makeshift cut-and-try type.

It was clearly recognized by the board of directors that if the space was to be rented every night and if conventions were to be brought to Milwaukee, it would be necessary to relight the auditorium so that the necessary effects could be produced. A preliminary engineering study revealed the fact that very little was known about artificial skylight illumination from a practical standpoint and that with the exception of the Cleveland Auditorium there were no successful installations of auditorium illumination obtained entirely from artificial skylight. A study of the transmission characteristics of different types of glass plates suitable for glazing skylights showed that the transmitted rays of maximum intensity are approximately perpendicular to the plane of the glass, that the direction of transmitted rays is independent of the angle of incidence and that the spread of light is limited in direction with an intensity proportional to the chords of a circle tangent to



ILLUMINATION OF THE MILWAUKEE AUDITORIUM USING THE NEW ARTIFICIAL SKYLIGHT



INSTALLATION OF THE PRISMATIC REFLECTORS ABOVE SKYLIGHT
A heavy duty plug and receptacle allow complete unit to be removed for cleaning and relamping.

the plane of the glass. A considerable portion of the light incident on the upper surface of the glass is reflected first from the air to the glass surface and again from the glass to the air surface back into the space above the skylight. The amount of this back reflection varies greatly for various types of glass and increases rapidly with decreases of angles of incidence from the normal.

The physical characteristics of lighting units were carefully studied and a list of these characteristics was made with their relative importance as indicated in Table I.

Although a consideration was given to three types of mirrored glass, one type of prismatic glass and one type of porcelain enameled steel, the superiority of the prismatic reflector as regards items 1, 4 and 7 in the table were the deciding factors.

The data in Table II are given for both the Cleveland Auditorium and the Milwaukee Auditorium and should be of value as design data for similar installations.

TABLE I—CHARACTERISTICS OF LIGHTING UNITS

1. Efficiency of the reflector 0 to 30 deg. zone	30
2. Efficiency of the reflector 0 to 60 deg. zone	10
3. Permanency of the reflecting surface	20
4. Ease of maintenance	10
5. Dust and dirt depreciation	5
6. Rugged construction of reflector and holder	5
7. Ease of adaptation of color filter	5
8. Standard equipment (spare parts)	5
9. Cost	10
	100

TABLE II—COMPARISON OF CLEVELAND AND MILWAUKEE AUDITORIUMS

	Cleveland Auditorium	Milwaukee Auditorium
Floor area, sq.ft	30,840	20,927
Skylight area, sq.ft	15,420	12,232
Ratio, floor area to skylight area	2	1.7
Illumination intensity, foot-candles	8	10
Generated lumens, watt	169–750 2,323,000	203–500 1,938,200
Generated lumens per square foot floor area	75.4	91.0
Type of reflector	Mirrored glass	Prismatic glass
Utilization coefficient, per cent	10.6	10.9
White light, total kilowatts	120	101.5
Watts per square foot floor area, white light	3.9	4.9
Colored lighting, total kilowatts	140	203
Watts per square foot floor area, colored lighting	4.5	9.9
Total kilowatts white and colored	260	304.5
Total number of reflectors	320	606
Height of skylight above floor, ft	80	65
Height of reflector above glass, ft	7	3.5

Electrically Heated Asphalt Tank

IN THE preparation of asphalt roofing material at its Kansas City plant the American Asphalt Roof Corporation has found it advantageous to apply electric heating units to maintain an even temperature and consistency of the compound used in the impregnation of roofing paper or felt. Asphalt is pumped into a tank at about 500 deg. F. and by the application of electric heat the radiation losses and heat absorbed by the paper are made up and a constant temperature is maintained throughout the whole volume of the saturant.

The electrical equipment consists of 54 kw. in General Electric air heaters placed in five 10-in. pipes located in the bottom of the saturating tank, which is 11 ft. long, 55 in. wide and 14 ft. deep. Leeds-Northrup instruments are used to control the temperature of the mixture in the tank, which is kept at a constant value of 440 deg. F.

Results of a test made on this equipment during an average daily run of ten hours are given in the accompanying tabulation. In the preparation of this material it is essential that the consistency of the saturant be kept constant throughout a run, as otherwise the paper or felt would receive different degrees of impregnation varying with the temperature. Use of electric heat with automatic temperature control has made possible very close regulation of process with consequent uniformity of the product. C. R. Berrien is industrial heating engineer for the Kansas City Power & Light Company, which supplies energy to this installation.

TEST COVERING TEN-HOUR RUN OF ELECTRICALLY HEATED ASPHALT TANK

Material treated	7,227 lb. 50 gage felt 1,904 lb. 31 gage felt 4,686 lb. 50 gage felt 4,876 lb. 72 gage felt
Total	18,693 lb.
Saturant used	4,218 gal.
Demand	54 kw.
Energy consumption	520 kw.-hr.
Material treated per kilowatt-hour	35.9 lb.

Digest of Electrical Literature

Generation, Control, Switching and Protection

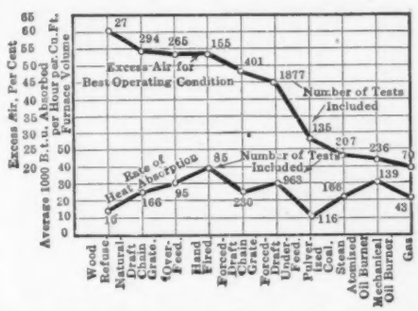
Lightning and Other Experiences with 132-Kv. Steel Tower Transmission Lines.—M. L. SINDEBAND and P. SPORN.—The author's experience with a 55-mile, 132-kv. transmission line since 1917 to date is cited, the particular line being one which has been very successful from a standpoint of continuity of service. Further experience with other lines built with variations on the original design and placed in service in 1924 and 1925 is given. A detailed analysis is given of 88 cases of lightning trouble on one of these lines during 1925, the various steps taken to reduce the frequency of this trouble being recounted. The effect of increased clearances and separations, of additional insulators, of flux control units and of arcing horns and shields on the amount of trouble and on the damage to insulator and conductor are discussed, both from the standpoint of actual experience and from the laboratory analyses and investigations made. A summation is given of the analysis and experience of the authors in operation of 132,000-volt lines as applied to transmission line design from the standpoint of continuity of service.—*Journal of the A.I.E.E.*, July, 1926.

Hydro-Electric Development and Steam Equipment

Safety of Operation in the Steam Plant.—The boiler room is responsible for a large percentage of the accidents in steam generating plants, according to the latest report of the accident prevention committee of the National Electric Light Association. Different types of mechanical equipment and different organization, whether the plant is used on base load, heat load or for stand-by service, are factors in the problem. But, in spite of this diversity, there are many hazards common to all power plants. Some of these are set forth in this report, which is confined to a consideration of the hazards of the boiler room and its immediate auxiliaries for the production of steam.—*Publication No. 256-68, N.E.L.A.*

Automatic Hydro-Electric Plant Designed for Peak-Load Service.—G. C. GEORGE. — This installation — the Soft Maple plant of the New York Utilities, Inc.—is designed for three 10,500-hp. turbines, two of which have been installed to operate under a 121.5-ft. head. The units are started and stopped automatically by closing or opening an oil switch at another station 4½ miles distant. Work on the construction was begun in April, 1924, and the plant was successfully put in operation September of last year.—*Power*, July 27, 1926.

Limiting Factors in Reducing Excess Air in Boiler Furnaces.—E. G. BAILEY.—This paper presents a study of the interrelationship and relative importance of the three factors closely related to excess air—namely, furnace temperature, unburned fuel, and heat loss in the chimney gases. The figure presents a summary of 3,767 combustion tests classified as to fuel—coal, oil and gas—coal being subdivided as to the method of firing into hand-fired, overfeed stokers, natural-draft and forced-draft chain-gate stokers, forced-draft underfeed stokers, and pulverized coal; while oil has been divided between steam-atomized and mechanical-atomized burners. These results were obtained over a period of ten years and represent all types of boiler and furnace equipment collectively. The lower curve shows the rate of heat absorption by the boiler and super-heater per cubic foot of furnace volume, this being merely indicative of the different types and methods of burning. It is to be noted that the number of tests in the lower line is less than that on the



SUMMARY OF COMBUSTION TESTS

upper, which is due to the fact that complete data as to furnace volume were not available in all cases.—*Mechanical Engineering*, July, 1926.

Units, Measurements and Instruments

A Frequency Mixer. — FREDERICK BEDELL.—For combining alternating current of two frequencies in various known proportions an induction motor with a wound rotor has proved useful. A two-phase motor with two primary windings designated as phase *A* and *B* has one winding connected to a source of electromotive force *A* of one frequency and the other winding connected to a source of electromotive force *B* of equal value but of a different frequency. As the rotor, turned by hand, receives different angular settings θ, where θ is the electrical and not the mechanical angle, the secondary voltage of one frequency, due to *A*, is $a \sin \theta$; the secondary voltage of the other frequency, due to *B*, is $b \cos \theta$. Here a and b are equal constants. The resultant secondary voltage is

$$\sqrt{a^2 \sin^2 \theta + b^2 \cos^2 \theta}$$

and is constant and independent of rotor position. The relative amounts of the two component voltages vary with θ and are determined by the position of the rotor. — *Journal of Optical Society*, July, 1926.

Equipment for Meter Calibration.—H. MELHORN.—Indicating watt-meters and integrating watt-hour meters require careful calibration and exact connection to indicate the real value sought. It is common practice to energize the current and the voltage element of such meters from separate sources, to economize on energy and to vary more easily the two factors independently from each other. What is claimed to be a "foolproof" calibrating method is made possible by an equipment described in this paper. It is essentially a three-phase switchboard, holding up to five meters, with instruments and switches so arranged as to make the calibration convenient and correct. With the board is used a special 3-kw. machine, with either horizontal or vertical shaft, comprising a driving motor and two generators (current generator and voltage generator). The stator of the latter can be adjusted in regard to its rotor to give any desired phase angle.—*Siemens Zeitschrift*, May, 1926.

Transmission, Substations and Distribution

Electrification Problem in France.—J. SORDET.—In France electrification began as did the first steam railways, without any prearranged scheme, but following the local conditions and needs. The work carried out up to the present may have been incomplete and insufficient; still, it complies on the whole with the limits set by the natural characteristics of the country. The matter of capital appears most vital to the realization of a national scheme of electrification. The method of financing different parts of the plan will vary according to each particular case. As for building and managing superpower lines, it seems that this should not be undertaken by independent companies, liable to suffer from competition, but by supercompanies closely interested in local matters and liable to benefit by interconnection. — *General Electric Review*, July, 1926.

Illumination

Effect of Mixing Artificial Light with Daylight.—C. E. FERREE and G. RAND.—In this study the following points are covered: A comparison was made of the effect of artificial light, daylight and mixtures of artificial light with daylight on acuity, speed of vision, power to sustain acuity and ocular fatigue. The object of these experiments was to ascertain whether there is anything detrimental to the eye in the mixture of artificial light and daylight so far as color and composition are concerned. In a second series of experiments the artificial light was turned on at different times in the late hours of the afternoon and the effect on speed of vision determined. A series of experiments covered a brief study of the problem relating to the adaptation of the eye. The object of this study was to show to what extent the eye is rendered deficient in the late hours of the afternoon by its previous exposure to a light of high intensity and by its failure to keep pace

by adaptation with the change of intensity.—*Transactions of Illuminating Engineering Society.*—July, 1926.

Motors and Control

A New Phase Advancer.—This new machine has the advantage that it can be supplied to produce either unity or any desired leading power factor at varying loads. Instead of the compensation falling off at light loads, as with some alternative devices for power-factor correction, the main motor can be made to draw a considerable leading current to compensate for lagging current in other parts of the system. In its latest form the Metropolitan-Vickers phase advancer is a simple alternating-current exciter, similar to a direct-current exciter, and it is connected in the exciter circuit of a synchronous induction motor. It differs from the usual direct-current exciter in that it has a series-connected field winding instead of a shunt winding. The series field arrangement gives the phase advancer a self-regulating characteristic, so that the voltage generated by the exciter increases with increase of load on the main motor.—*Engineer (England)*, July 16, 1926.

Key System Transit Company Completes 1,500-Kw. Substation.—H. P. BELL.—Aside from the fact that this set can be controlled from a remote point, the outstanding feature of the installation is a motor-generator used with automatic control equipment which allows 300 per cent overload until the windings reach a predetermined temperature, at which point load is automatically relieved to prevent dangerous overheating.—*Electric Railway Journal*, July 10, 1926.

Heat Applications and Material Handling

Comparative Costs for Bathroom Water Heaters.—A. LUFT.—In this article are recorded maintenance and operating costs of various heating methods for preparing hot water in bathrooms. Assuming an average of 250 lb. of water to be raised from 13 deg. to 35 deg. C., paying average prices for coal, gas and electric power, one hot bath will cost: For coal heating, 8 cents; for briquette heating, 9 cents; for gas heating, 12 cents; for electric heating, 15 cents. Considering the safety and convenience of electric heating, the author foresees a final victory of electric water heating in the same way as such a victory was won 25 years ago in the rivalry between gas and electric lighting.—*Elektrische Betrieb*, June, 1926.

Electrophysics, Electrochemistry and Batteries

Electrolytic Chlorine at Sacramento.—H. N. JENKS.—Flexibility of control and economy characterize the operation of chlorination direct from chlorine cells in this installation at Sacramento, Cal. The equipment consists essentially of direct-current generating apparatus together with suitable control and switching panels and electrical connections supplying six 600-amp. electrolytic cells arranged to operate in series. The investment charges against the electrolytic chlorine plant installation are included in a unit-operating cost per pound of chlorine produced. Depending on the amount used during the year, the cost varies from 5 to 7 cents per pound in contrast to 12½ cents per pound as the average price paid for liquid chlorine alone, exclusive of dosing equipment for the latter. Based on a total chlorine consumption for the year 1925 of 15,600 lb., of which 15,000 lb. was produced electrolytically at the plant, the charge was very closely 12 cents per 1,000,000 gal. of water treated.—*Engineering News-Record*, July 2, 1926.

Telegraphy, Telephony, Radio and Signals

Specific Study of Conditions Affecting Range of Radio Stations.—C. M. JANSKY, JR.—This paper describes the organization of a group of observers by the bureau, the methods used for making observations and the forms used for recording 8,500 observations made over a period of a year (1922-23). The data obtained were analyzed on automatic machines, and charts were

RELATIVE MAGNITUDE OF OBSTACLES TO RECEPTION, AUG. 1, 1922, TO JULY 31, 1923, BASED ON 7,372 OBSERVATIONS

given showing the variation of strength of atmospheric, variation of fading, relative magnitude of obstacles to reception, variation of interference from receiving sets, relative magnitude of obstacles to reception grouped in bimonthly periods, and mean reliability of reception as a function of distance.—*Bulletin No.* 297, *United States Bureau of Standards.*

Traction

High-Speed Circuit Breaker in Railway Feeder Networks.—J. W. MCNAIRY.—A method of isolating grounded sections of extensive feeder networks supplying power to railways without disturbing the power supply to other sections is the subject discussed in this article. This has been successfully accomplished, according to the author, by utilizing the inherent characteristics of the magnetic type of high-speed circuit breakers in the manner described. A description of an experimental investigation on an equivalent network for a representative section of feeder system, made up by using reactors and resistors, has been given. Complete selective operation, isolating a defective feeder without disturbing the power supply to interconnected feeders, was obtained for all locations of the short circuit. Breakers of the type used successfully on direct-current networks can be applied to alternating-current networks and the advantages of high-speed protection realized.—*Journal of A.I.E.E.*, July, 1926.

One Owner's Faith in the Trolley.—This is an account of the rejuvenation of the Steubenville, East Liverpool & Beaver Valley Traction Company. The railway is but 43 miles long, running between Beaver, Pa., and Steubenville, Ohio. In addition to the interurban, city service is given in East Liverpool, Chester, W. Va.; Steubenville and, since January, 1926, within Toronto, Ohio, on the main-line track. Other local services along the main line are given from Midland, Pa., as far as Wellsville, Ohio. To four general improvements—straighter tracks, higher speed, greater safety and more attractive cars—is credited the success of this electric railway under its new management.—*Electric Railway Journal*, June, 1926.

Miscellaneous

Electric Arc Saw.—W. KRASKA.—At the recent exposition in Leipzig was shown a novel type of saw or shear to cut structural steel profiles quickly and smoothly. A 30-hp. motor drives a large, thin steel disk at very high speed. A 35-kw. single-phase transformer, the secondary voltage of which is only 15 volts, feeds a circuit between the disk and the steel piece to be cut. At the point where the revolving disk touches the steel piece an arc flame is formed, which liquefies the metal and as the driven disk is moved forward a clean saw cut is produced. The speed of cutting is 250 cu.cm. in 40 seconds, at a consumption of 1 kw.-hr.—*Elektrotechnische Zeitschrift*, May, 1926.

Power Factor and Tariff.—EDWARD V. CLARK.—The great amount of attention now being given to the question of poor power factor suggests that tariffs such as are commonly used today are unsuitable in present circumstances. The paper contends that a wattless component of current, despite its having no energy content, involves the supply undertaking in extra running costs, and that therefore a charge should be levied for supplying it. A three-part tariff is proposed, embracing a periodic charge per kva. of maximum demand, a charge per kilowatt-hour of energy and a charge per kva.-hour of lagging wattless component. The additional running costs caused by wattless component are briefly touched on, and it is suggested that in a station with an average power factor of 0.7 the charge per kva-hour of wattless component should be about one-ninth of the charge per kilowatt-hour of energy. The question of metering the three-part tariff is discussed, and a method is shown whereby, with balanced load, a three-phase wattmeter may be "biased" to record the total energy consumption plus or minus any desired fraction of the kva. hours of lagging or leading wattless component.—*Journal of Institution of Electrical Engineers (England)*, June, 1926.

News of the Industry

St. Lawrence Situation

New York and Ontario Officials Hold Another Conference—Many Steps Remain to Be Taken

VARIOUS important features in connection with St. Lawrence power development were discussed at another conference between officials of the New York State Water Power Commission and members and engineers of the Ontario Hydro-Electric Power Commission, held in Toronto on July 28. The representatives of New York State who attended the conference were Roy G. Finch, State Engineer and chairman of the Water Power Commission; Randal J. Le Boeuf, Jr., Deputy Attorney-General of New York State; Friend P. Williams, secretary of the New York State Water Power Commission, and John P. Newton, Assistant State Engineer. Ontario was represented by C. A. Magrath, chairman of the Ontario Hydro-Electric Commission; F. A. Gaby, chief engineer; Premier Ferguson and several other officials.

In the interval since the last conference the Ontario Hydro-Electric Commission has investigated very closely the New York proposals and has submitted in turn its proposals for power development on the St. Lawrence.

"The last conference," said Mr. Le Boeuf, "was to consider primarily the engineering problems involved. The Canadian officials seem to have reached the conclusion that from the standpoint of the amount of energy produced the single-stage development would be better, but there are both political and sentimental problems to be taken care of."

STEPS TOWARD DEVELOPMENT

The next step in the power development program will be for the New York State Water Power Commission, if it decides to issue a license, to meet and formally declare the value of a development of the St. Lawrence River water power, make a declaration that such development is for the public benefit and state under what terms and conditions it will issue a license. Then, after fifteen days' notice, it can issue a permit for development to the applicant which accepts the terms and conditions, if the commission be satisfied of the responsibility of this applicant.

No definite date has as yet been set for a meeting of the New York State Water Power Commission. At the present time the State Engineer and members of the commission are engaged in making a study of the Canadian plans as well as those submitted by the applicants for permits. On the Canadian side the development may be had under state ownership, while on the American side it may be brought about by private capital, but what must be determined is that the location of the dam or dams is acceptable to the Canadian people. The single-stage development would flood approximately 36,000 acres, while the two-stage development would inundate about 6,000 acres. However, with the two-stage development the majority of the lands flooded would be on the Canadian side.

If the New York State Water Power Commission decide to issue a license to either of the applicants, a further conference with the Canadian officials will probably be necessary. After such a license is issued by the New York State Water Power Commission, by the Hydro-Electric Commission of the Province of Ontario and by the Federal Power Commission at Washington, approval must then be had by the Joint International Commission created by international treaty with Great Britain in 1910.

The commission is still engaged in studying the plans submitted by the Lower Niagara River Power & Water Supply Company under its application to develop power on the American side in the lower Niagara gorge. This corporation has made an application to the federal authorities for a permit. Here, as with the St. Lawrence, the next step is for the Water Power Commission to make a formal declaration that public benefit will result from the development and set a value upon it. This being done and proper notice having been given, the permanent license may issue, subject to approval by the International Joint Commission.

Illinois Utility Heads' Political Gifts

Senate Committee Learns of Large Contributions by Samuel Insull, Clement Studebaker and Ira C. Copley—Insull Gave to Both Parties

STORIES of lavish expenditure in the recent political primaries in Illinois, when Frank L. Smith, chairman of the Illinois Commerce Commission, defeated Senator William B. McKinley for the Republican nomination for United States Senator, brought about the appointment by the Senate of a committee of investigation headed by Senator Reed of Missouri. This committee, sitting at Chicago, has brought out from witnesses that a fund totaling almost a million dollars was spent in the primaries by those in charge of the campaigns of various candidates.

Particular interest has been evinced by the investigators and the press in contributions made by men in control of public utility companies, and in this respect there has been some frank testimony establishing the fact that such political gifts ran into very high figures. It was testified that Samuel Insull, who was called as a witness, made contributions of $193,735, including $125,000 to the Smith fund, $33,735 to pay for propaganda against the World's Court, $10,000 to a Republican faction known as the Crowe-Barrett group, of which Edward H. Wright, a member of the Commerce Commission, is leader, and $10,000 to the "Deneen group." Mr. Insull also gave $15,000 to George E. Brennan, the candidate for Senator in the primaries of the Democratic party, of which he is the state leader.

A contribution of $25,000 was made to the Smith fund by Mr. Copley, according to the testimony of Allen F. Moore, Mr. Smith's campaign manager, and one of $20,000 was made to the same fund by Mr. Studebaker. Thus the three public utility executives contributed together $203,735 to the Smith fund, if Mr. Insull's anti-World Court expenditure be included. Mr. Studebaker is president of the Illinois Power & Light Corporation and of the North American Light & Power Company. Mr. Copley is prominent in the Western United Gas & Electric Company and the Western United Corporation.

The fact that Senator McKinley was until recently an active utility holding company executive and that he is still chairman of the board of the Illinois Power & Light Corporation, of which Mr. Studebaker is president, has naturally aroused gossip. Mr. Studebaker is one of a group of financiers who recently bought control of the associated power, light and interurban traction companies formerly owned by Senator McKinley. Gossip has also concerned itself with alleged antagonism between Mr. Insull and Mr. McKinley as supposedly rival utility men, but questions aimed by Senator Reed to bring out the existence of such rivalry failed to do so. Financial manuals show Mr. Insull's varied concerns to have assets of $500,000,000 to $600,000,000, Mr. Studebaker's $335,000,000 and Mr. Copley's $54,600,000.

INSULL OPPOSES COMMITTEE

Recalled to the witness stand on Wednesday, Samuel Insull, on the advice of counsel, disputed the right of the committee to inquire into any contributions save those for the senatorial primaries and was finally told by Senator Reed that he would be reported to the Senate. Mr. Reed maintained that the campaign funds were so inextricably mixed that the committee had the right to inquire into the sources of money raised ostensibly for contests over local nominations.

At the request of the chairman Mr. Insull handed over a slip of paper

detailing his expenditures in the senatorial campaign. "As I stated before," he said, "I gave $125,000 to promote the candidacy of Frank L. Smith as the Republican senatorial candidate. I spent $32,925.19 in a propaganda campaign against American adherence to the World Court and $15,000 to promote the candidacy of George E. Brennan as the Democratic candidate for the senatorial nomination."

It was then that the chairman asked about other contributions and Mr. Insull declined to answer. These inquiries related to the contribution of $10,000 to the Crowe faction and of another $10,000 to the Deneen group. The latter group supported Senator McKinley, and Chairman Reed adroitly drew from Mr. Insull an admission that he did not know this when he "made the contribution." Mr. Insull joined in the laughter which followed. He declared emphatically that all political contributions made by him were "absolutely fair and square" and not contrary to public morals.

Ira C. Copley of Aurora, Ill., another Wednesday witness, who is a former member of Congress, identified himself as a publisher, explaining that he had sold out his holdings in the Western United Gas & Electric Company and affiliated companies on Jan. 25. He still holds an honorary position on the board. Chairman Reed developed that the Illinois Commerce Commission approved an application of these utility interests for an increase of rates on Nov. 11, 1925.

"When did you make your first contribution to Smith's campaign fund?" Senator Reed asked.

"It was after that," Mr. Copley said, adding, however, that he had contributed six years ago to a similar fund.

"Did any of the money you gave come directly or indirectly from your companies?"

"Not directly, but indirectly, as my income was from the companies and their sale."

Copley said that his last contribution to Smith's campaign was made after he had sold out his utility interests.

SMITH HITS BACK

Frank L. Smith struck back at those who have assailed him on account of contributions made to his successful senatorial candidacy by public utilities executives. In a statement filed with the committee and afterward repeated on the witness stand the chairman of the Illinois Commerce Commission declared that at no time and under no circumstances had he obligated himself to any person, directly or indirectly, on account of any assistance given his campaign. He told of his impartial administration of his office and defended the action of the commission in sanctioning the purchase by the Insull interests of the Chicago, Peoria & St. Louis Railroad, which was assailed in the Senate by Senator McKellar of Tennessee last March.

The senatorial candidate then reviewed decisions of the commission and presented a summary to show that from January, 1922, to June 30, 1926, public utility rates in Illinois were reduced by $78,425,803, of which $41,667,477, or 53.13 per cent, affected Insull properties in and out of Chicago.

Wagner's New President

Preston B. Postlethwaite is Appointed Head of the St. Louis Firm—Sketch of Career

WHEN the directors of the Wagner Electric Corporation of St. Louis, dissatisfied with its financial showing, forced the retirement of W. A. Layman from the presidency of that company two months ago (see ELECTRICAL WORLD for June 5, page 1257) executive control of the organization was vested in a committee of four — Vice-presidents Preston B. Postlethwaite and A. H. Timmerman, General Superintendent G. L. Evans and Treasurer V. W. Bergenthal. This arrangement, obviously temporary in its nature, has just been superseded by the appointment of Mr. Postlethwaite to the presidency, and he at once entered upon the duties and responsibilities of the office.

P. B. POSTLETHWAITE

The new president, who is only 42 years old and therefore one of the youngest executives of large industrial companies in the country, entered the employ of the Wagner company seventeen years ago as an apprentice. Many promotions based solely on personal merit led to his becoming a vice-president in 1923. He was born in Mifflin County, Pa., and educated in the public schools of Huntingdon, Pa. During his vacation periods and on Saturdays he worked for the Huntingdon Gas & Electric Company, of which his father was manager. In 1900, when he completed his high-school course, he entered the employ of the Pennsylvania Bell Telephone Company, working as a lineman, troubleman, switchboard troubleman and later as gang foreman.

Mr. Postlethwaite was graduated from the Penn State College as an electrical engineer in 1909 and then began his apprenticeship with the Wagner company at 15 cents an hour. The following year he was transferred to the Cincinnati sales office, and two years later he was promoted to be manager of that office under the supervision of the Detroit district manager. In 1914 he was again promoted, this time to the district managership of the Cincinnati territory, and in 1916 he returned to St. Louis to organize and manage the service department of the company. Two years later he advanced another step, being named as Mr. Layman's assistant in handling the war contracts of the company. The following year he became assistant sales manager in charge of the automobile department and also manager of the service department. In 1921 upon the resignation of one of the vice-presidents of the company he assumed the duties of that office, and two years later, as already stated, he was elected vice-president. He has been a director of the company for two years.

Avon Plant Dedicated

Charles F. Brush Turns on the Power in Cleveland Electric Illuminating Company's New Station

AT EXACTLY noon on Wednesday, Aug. 4, the Cleveland Electric Illuminating Company's new Avon station was officially started when Charles F. Brush, inventor of the Brush electric arc lamp and father of electric illumination in Cleveland, now in his seventy-eighth year, opened the throttle of the first 35,000-kw. turbine in this plant, which will have an ultimate capacity of 300,000 kw. The ceremonies brought about a reunion of a number of electrical pioneers. Alex Dow, president Detroit Edison Company; William McClellan, past-president A.I.E.E.; Andres Squire and James Parmelee, who with Myron T. Herrick, Ambassador to France, were actively interested in the early establishment of the Cleveland company; T. O. Kennedy, vice-president Ohio Public Service Company, and many others prominent in the electrical industry were present. After inspection of the plant those attending the opening were the guests of Robert Lindsay, president Cleveland Electric Illuminating Company, at a luncheon served in the Avon station.

Mr. Brush remarked that although only 48 years have passed since he invented his arc lamp, he frequently meets people "who think I belong to the ancients, along with Archimedes, Galileo, Euclid and Newton. But I cannot find fault with their opinion when I survey the astounding development that the electrical industry has recorded in those short 48 years."

The Avon plant, which is described elsewhere in this issue, represents an eventual investment of more than $30,000,000. It is 23 miles west of Cleveland on Lake Erie. The addition of its initial equipment will raise the rating of the Cleveland company to more than 375,000 kw., and when the plant is finished the company's total rating will be 600,000 kw. While high-tension connections have been made to carry power to distant parts of the state, it is expected that most of the company's eventual great capacity will be taken locally through the intensive development of Cleveland's iron, steel and other industries. For this reason the opening of the Avon station is regarded as one of the most important industrial developments in the region.

Assail Illinois Commission

Delegates from 45 Cities and Towns Pass Resolutions Declaring for "Home Rule"

FORTY-FIVE Illinois cities and towns have organized to co-operate for repeal or amendment of the public utilities act and will unite with the Illinois Municipal League in its campaign against the measure, which it is claimed has placed too arbitrary powers in the hands of the Illinois Commerce Commission. One hundred representatives from all over the state attended the "home rule" meeting held at Peoria recently on invitation of the City Council. Francis X. Busch, corporation counsel for Chicago, was leader in the meeting, and the towns represented at the gathering organized the Illinois Municipalities Home Rule Conference to make permanent the organization, pledging themselves to co-operate with the Municipal League in its campaign. A meeting will be held not later than Sept. 15 to complete organization.

Resolutions adopted by the convention set forth that "passage of the public utilities act of Illinois and interpretation of that act by the Supreme Court of the state have deprived municipalities of practically all legislative authority and governmental control over public utilities operating within their respective limits and serving their people and have reduced the cities and villages of Illinois to the status of complainants and petitioners—supplicants merely—before the Illinois Commerce Commission in all matters relating to public utilities services," and that "regulation of public utilities by the Illinois Commerce Commission is slow and expensive and imposes upon municipalities burdensome and litigious proceedings."

The resolutions passed stated further that "fourteen years' experience with regulation of public utilities by the Commerce Commission has demonstrated that such regulation has not achieved the declared purpose of the public utilities act." It was further resolved that the act "should be repealed or so amended that any municipality in this state desiring to do so may have practicable opportunity to exempt and withdraw itself from the operation of said act and the jurisdiction of the Commerce Commission and upon such withdrawal shall possess full and adequate legislative authority and governmental control of the public utilities serving its people to effectually regulate the rates, service, facilities and operations of such utilities so as to safeguard and promote the safety, comfort and convenience of its inhabitants."

The terminable permit proposal was attacked as abolishing "the last defense of the municipality."

Los Angeles to Vote on Power Bond Issues

Bond issues totaling $21,000,000 for the use of the city's water and power departments will be submitted to the voters of the city of Los Angeles at the Aug. 31 primary election. Of this total $11,000,000 is for the power department and $10,000,000 for additional water and water-distributing facilities.

E. F. Scattergood, chief electrical engineer for the Bureau of Power and Light, in explaining the purposes for which the funds from the power bonds would be issued, outlined three major expansion programs which are called for at the present time, as follows:

1. Development of 28,000 hp. additional hydro-electric energy along the Owens River aqueduct.

2. Acquisition of rights-of-way and the construction of tower lines and two new electric stations as a part of a high-voltage transmission system which ultimately will encircle the city.

3. Purchase of privately owned electric distribution lines in recently annexed districts.

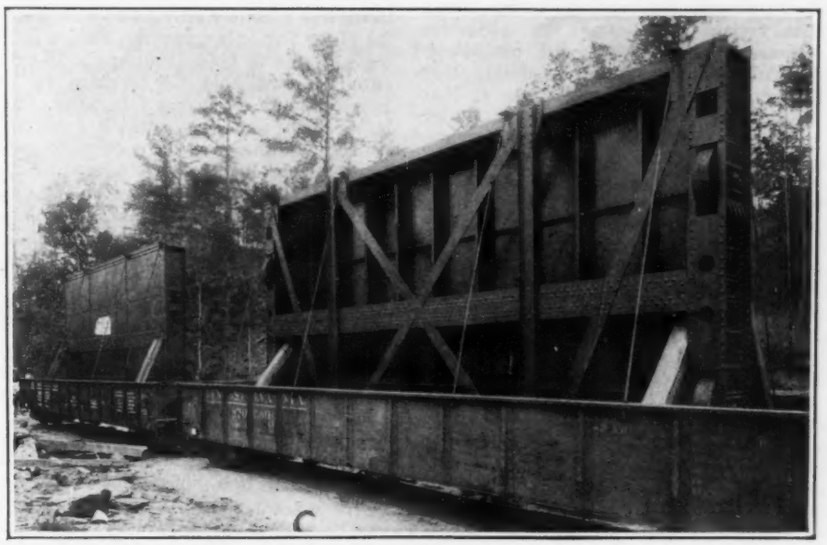
Mr. Scattergood also said that independent of this bond issue a standby steam plant rated at about 25,000 kw. is to be constructed by the bureau immediately upon receipt of materials and equipment. This is the plant that the Southern California Edison Company is seeking to enjoin.

Of the $11,000,000 for the power department, the larger items cover additional water storage, $1,500,000; completing generating plant No. 1, $1,250,000; rights-of-way for new high-voltage line, $3,700,000, and acquisition of new lines, $2,000,000. Other items include additional equipment and facilities for the distribution system.

Boston Edison Expansion to Cost Five Millions

With the decision to award a contract to the General Electric Company for a 60,000-kw. turbine unit to be added to its Edgar station, executive authorization of the immediate enlargement of the building at this plant and the pushing of field work on a 110-kv. steel-tower line from Weymouth to Medway, the Edison Electric Illuminating Company of Boston is embarking upon a comprehensive expansion program. Upward of $5,000,000 will be required in enlarging the Edgar station at Weymouth, upon which about $13,000,000 has already been expended. The new development will double the capacity of the station. The present switch house will be enlarged in connection with the station development. The work will be done by Stone & Webster, Inc., Boston, under the supervision of I. E. Moultrop, chief engineer of the Edison company.

Rushing 21 Spillway Gates to Martin Dam, Ala.



AN UNUSUAL movement of freight was involved in the transportation from Midland, Pa., of the 21 assembled spillway gates for the Martin Dam, now nearing completion on the Tallapoosa River for the Alabama Power Company. The gates weigh 41,000 lb. each and are 16 ft. high, 32 ft. 3 in. long and 2 ft. 6 in. thick. Owing to the limited width of freight cars it was necessary that the gates be shipped on their edges, thus concentrating their weight on a small space and necessitating an exceedingly strong car. To ship them knocked down would have meant a delay of many weeks at the dam, probably carrying the work into the high-water season, and this the Alabama Power Company was anxious to avoid.

The manufacturer was advised by the railroads that the gates could not be shipped completely assembled over the usual route on account of their size. The first problem was to discover a suitable type of freight car. This was found in an all-steel, flat-bottomed car in use by the Pennsylvania Railroad. A minute examination of the clearances of the various railroads which might be used to take the gates to their destination was then made, and it was found that seven railroads must be used to give a maximum clearance of bridges and tunnels of 19½ ft. The cars accordingly followed a tortuous route from Midland, Pa., to Lima, Ohio; Paxton, Ill.; Cairo, Ill.; Tuscaloosa, Montgomery, Milstead and Asbury, Ala., and the company railroad to Martin Dam. Had the gates been ordinary freight, three railroads could have performed the work. The illustration shows two of the 21 spillway gates en route for their destination at the dam.

Basle Power Conference

Program of Technical Papers Will Be Supplemented by Trips of Inspection and Pleasure

FURTHER details of the program adopted for the sectional meeting of the World Power Conference to be held in Basle, Switzerland, beginning on the last day of August, are to the effect that Tuesday afternoon, Aug. 31, and Wednesday, Sept. 1, will be given over to the reports on utilization of hydraulic power and inland navigation. Thursday and Friday, Sept. 2 and 3, will be taken up with discussions on railway electrification and electricity in agriculture. On Saturday and Sunday, Sept. 4 and 5, a special train provided by the Swiss Federal Railways will take the party to the Gotthard Tunnel to inspect the electrification works. Monday and Tuesday, Sept. 6 and 7, will be given up to the reports on hydro-electric and steam power and the exchange of power between countries. The closing meeting will be held on Wednesday, Sept. 8.

Following the conference a number of visits to industrial establishments have been arranged for Sept. 8 and 9, and from the tenth to the thirteenth there will be two somewhat longer excursions which will enable the visitors to see something of the scenery of Switzerland. One will be to the Engadine with Buchs as the objective, whence opportunities will be offered for further excursions to Austria, Germany, Czechoslovakia, Hungary, Norway and Sweden. These will be organized by the national committees of the countries concerned. The other excursion will include the Bernese Oberland and the west of Switzerland, with the possibility of extended trips to Italy, France, Belgium and Holland.

TWENTY-NINE NATIONS TAKE PART

Twenty-nine countries have agreed to take part in the conference and 75 reports have been received. The names of the five Americans who will respectively contribute papers under the five topical divisions of the conference were given in the ELECTRICAL WORLD for June 26, page 1411. Since then John M. Gallalee of the University of Alabama has been associated with W. E. Mitchell in the presentation of his paper on the relation between hydro and steam electric systems. As already announced in these columns, O. C. Merrill will be the official American delegate and John W. Lieb will preside over the session on Sept. 6.

No country is to submit more than one report on each of the subjects proposed. Five general reporters have been nominated who will each prepare a general report or digest of the individual reports submitted in the five classes, emphasizing those points the discussion of which is felt to be especially desirable. The general reporters will also open the discussions by a short address. These reporters are E. Payot of Basle, J. Landry of Lausanne, A. Nizzola of Baden, F. Ringwald of Lucerne and E. Huber-Stockar of Zurich, and they will cover respectively the utilization of hydraulic power and inland navigation, the exchange of electrical energy between countries, the economic relation between electrical energy produced hydraulically and electrical energy produced thermally, electricity in agriculture, and electrification of railways.

The delegates of the American committee of the World Power Conference who will attend the sectional meeting are as follows: O. C. Merrill, general chairman American committee; Oliver F. Allen, International General Electric Company, Paris; Dr. Harry E. Clifford, Gordon McKay professor of electrical engineering, Harvard University; Col. Hugh L. Cooper, consulting engineer, New York City; Dr. A. E. Kennelly, professor of electrical engineering, Harvard University; John W. Lieb, vice-president New York Edison Company, member of executive committee American committee; Louis Marburg, Marburg Brothers, Inc., New York City; George A. Orrok, consulting engineer, New York City; David B. Rushmore, member of executive committee American committee, and O. G. Thurlow, chief engineer Alabama Power Company. An attendance of 300 delegates from all countries is expected, according to reports received this week.

Public Service Plans to Care for Increased Rail Load

The Public Service Production Company has recently carried to completion its plans for enlarging the Public Service Electric & Gas Company's 25-cycle capacity available for service to the Pennsylvania Railroad Company. The latter company now obtains from this source its entire supply of power for the electric locomotives operating between Manhattan Transfer, N. J., and the Pennsylvania Terminal, New York City. The current is carried at 11,000 volts to a point on the Pennsylvania right-of-way near Snake Hill by a three-circuit connection leading from a specially constructed outdoor substation adjacent to the Marion central station. At this substation transformers step the voltage down from 13,200.

Connecting the substation to the 60-cycle, 13,200-volt system of the Public Service are two 300-r.p.m. frequency-converter sets, each having a continuous rating of 13,900 kva. at 90 per cent power factor. The second unit, which went into service on May 19, is designed to carry 150 per cent load for five minutes and 200 per cent load for one minute. Both 25-cycle generators are capable of being rewound and equipped with new rotors so as to operate as 360-r.p.m., 60-cycle, 13,200-volt synchronous condensers. The two frequency converters are of Westinghouse manufacture and are installed in the Marion station, where facilities have been provided in the new switch house to take care of the second set.

Other important alterations connected with the increased Pennsylvania demand include the replacement with 60-cycle apparatus of the 25-cycle synchronous converters supplying the Public Service Railway Company in nearby territory. The substations affected are Seventh Street, West New York; Fourteenth Street, Hoboken, and Palisade Avenue, Jersey City.

Report of Ontario Hydro

Claim Is Set Forth that Its Commercial Rates Correspond with Its Domestic Charges

THE annual report of the Ontario Hydro-Electric Power Commission for 1925 shows that operations were on a larger scale than in any previous year and that the system is apparently in an excellent financial condition. It distributed in December a peak load of 867,443 hp., an increase from the 769,952 hp. of the previous year. The total revenue was $18,002,148, from which it has met all its expenses, transferred the sum of $3,716,833 to a renewal sinking fund and achieved a surplus of $437,848. The report further shows that the local municipal commissions received revenues from the public to the amount of $20,119,114, having a total surplus after paying fixed charges, etc., of $1,080,277. The number of municipalities co-operating during the year was 243. The total investment of the public in the Hydro undertaking is given as $276,720,073, of which $198,998,979 represents the investment of the commission, the remainder being furnished by the municipalities for distributing systems and other assets.

The commission declares that it has endeavored to furnish power at a minimum cost to the consumer, and, according to the report, its success is evidenced by the fact that whereas in the United States the average price of electricity to the domestic consumer was 7.5 cents per kilowatt-hour, the corresponding cost in Ontario was less than 2.1 cents. Rates for commercial light and industrial power, the report says, are correspondingly low. More than 80 per cent of the electrical energy sold for commercial light service is said to be supplied at an average cost of less than 3 cents per kilowatt-hour and 70 per cent of power service is furnished at less than $25 per horsepower-year. It is noted that there was a steady increase of customers, especially in connection with the Niagara system, which has been met by putting additional units into operation. A considerable expansion in rural service is announced. The number of customers on Ontario farms has increased from 9,961 to 12,395. The revenue from this source was $566,212, while expenses of generation and delivery totaled $476,728, the surplus being thus $89,484.

Electragist Convention Marks Quarter-Centennial

The annual convention of the Association of Electragists International, to be held at Cedar Point, Ohio, Aug. 24-27, will signalize the twenty-fifth anniversary of the formation of a national body of electrical contractors. The association was established in Buffalo, N. Y., in July, 1901, with 49 men present. It is expected to have approximately 750 in attendance at the 1926 meeting.

Features of the program include an address by Gerard Swope, president General Electric Company, and the discussion of two important subjects: "Shall there be set up an electragist standard for wiring installations?" and

"Is state or municipal licensing of electrical contractors needed, and in what form?" There will also be these addresses and discussions: "Survey of Electragist Relationships," by President Joseph A. Fowler; "An Electrical Department Store," by G. Fred Laube, Rochester; "Trade Policy Trends and Results," by W. Creighton Peet, chairman trade policy committee; "Job Control and Measurement of Labor Efficiency Through the Use of Graphic Charts," by Walter H. Taverner, New York; "Post Mortems and Their Application," by O. F. Wadleigh, Indianapolis; "Labor Data on High-Tension Transformer Vaults," by Harry C. Turnock, Cleveland; "Practical Application of the Electragist System of Estimating," by C. J. Geisbush, Los Angeles; "Analysis of Some Typical Wiring Installations," by J. H. Schumacher, Winnipeg, and "New Developments of Wiring Data," by Technical Director Arthur L. Abbott.

Joint and group meetings of state associations, a conference of state and local secretaries, sectional meetings of the union-shop and open-shop divisions, the award of the James H. McGraw contractor-dealer medal and the twenty-fifth anniversary banquet will be other things on the program. The manufacturers' exhibition is expected to be the most complete yet held, and the entertainment arrangements will leave nothing to be desired.

Activities of the Federal Power Commission

The application of the Broad River Power Company for a preliminary permit covering a power project on the Saluda River at Drehers Shoals in South Carolina has been rejected by the Federal Power Commission. This application was in conflict with that of the Lexington Water Power Company, which is regarded as the more comprehensive development of the resources of the river.

The commission recently has issued and forwarded licenses as follows: Pacific Power & Light Company, transmission line in Washington; California-Oregon Power Company, transmission line from Chiloquin to Bray Mill; Bluster Gold & Silver Mining Company, transmission line in Nevada; town of Highlands, N. C., small municipal development on the Cullasagee River; Shenandoah River Power Company, covering a transmission line across the Shenandoah National Forest in Virginia.

Preliminary permits have been forwarded as follows: Roy Holland, Fox River, Ill.; Knight, Kay, Stone, Haw, Breeden & Wilson, 6,000-hp. project on New River in California; Illinois Northern Utilities Company, Illinois River near Byron.

Robert S. Gordon of Louisville, Ky., has applied to the commission for a preliminary permit covering the proposed development of power at Lock No. 9 and Lock No. 12 on the Cumberland River in Jackson and Clay Counties, Tenn. As these dams flood out at times, the projects have no primary power. It is proposed to install equipment sufficient to develop 10,000 kw. at each site. Eventually this is to be increased to 13,000 kw. These plants are to be interconnected with those of the Kentucky Hydro-Electric Company. This latter company has submitted an application for a preliminary permit covering Dam 15.

The Arizona Sodium Production Company of Phoenix has applied for preliminary permit covering a proposed dam and reservoir on Aravaipa and Turkey Creeks, in Pinal and Graham Counties, Ariz. The power is intended for mining purposes.

Purchases and Mergers

Continued Activity in New York State—New England, Middle West, South and Pacific Coast Also Represented—Merger in Havana Approved

OPPOSITION to acquisition by the Mohawk-Hudson Power Company of all or more than 10 per cent of the stock of three companies in central New York was withdrawn when the Public Service Commission resumed hearings on July 29. A postponement had been asked by Fred D. Corey, president of the Niagara, Lockport & Ontario Power Company of Buffalo. The three companies are the Syracuse Lighting Company, valued at more than $7,000,000; the Seneca River Power Company, Baldwinsville, N. Y., valued at more than $200,000, and the Mexico Electric Company, Mexico, N. Y., valued at $21,000, in all of which the United Gas Improvement Company has been interested. The application was granted.

The union of various New York State public utility properties operated in the Associated Gas & Electric system in northeastern, central and eastern sections has been authorized by the Public Service Commission. In the counties of Clinton and Franklin consent has been granted to transfer the properties of the Chasm Power Company, Champlain Electric Company and N. I. White to the Plattsburg Gas & Electric Company. In central New York the New York State Gas & Electric Corporation will acquire the properties of the Berholme Power Company, Seeley Electric Company, Smyrna Electric Light Company and the Earlville Electric Light Company. These have all been interconnected. In eastern New York the Eastern New York Electric & Gas Company has been authorized to take over the properties of the Halfmoon Light, Heat & Power Company, Dwass Electric Company and the Salem Light, Heat & Power Company. The Eastern New York Electric & Gas Company has also petitioned the commission for consent to the transfer to the Plattsburg Gas & Electric Company of franchises, works and systems in Mechanicville, Granville, Salem, Stillwater and ten adjoining towns.

By this authorization the commission consents to the transfer by the Smyrna Electric Light & Power Company to the New York State Gas & Electric Corporation of its franchises, works and systems in Smyrna and the towns of Smyrna and Sherburne, Chenango County. The Smyrna company now buys its energy from the Earlville Electric Company, which buys from the municipal lighting plant at Hamilton, which buys in turn from the New York State Gas & Electric Corporation.

A certificate has been filed in the office of the Secretary of State at Albany, N. Y., merging the New Berlin Light & Power Company, Madison Power Company, Southern New York Power Company, West Branch Light & Power Company of Stamford, Waterville Gas & Electric Company, Sullivan County Light & Power Corporation, Fleischmanns Light, Heat & Power Corporation and the Delaware County Electric Light & Power Company with the Moravia Electric Light, Heat & Power Company.

The Fulton County (N. Y.) Gas & Electric Company, under a petition filed with the Public Service Commission, asks that it be authorized to purchase all the outstanding common stock of the Fort Plain (N. Y.) Gas & Electric Light, Heat & Power Company, which supplies Fort Plain and Nelliston with electricity and gas.

The St. Lawrence County Utilities Company of Ogdensburg, N. Y., has purchased the electric lighting plant at De Kalb Junction, N. Y., and will connect it with its power and light system, which extends to various parts of St. Lawrence County.

The Derby (Conn.) Gas & Electric Corporation, has acquired 99.9 per cent of the capital stock of the Derby Gas & Electric Company and the entire stock of the Wallingford Gas Light Company. The corporation thus owns properties supplying electric light and power and gas to Derby, Shelton and Ansonia. The Citizens' Utilities, Inc., of New York recently bought a controlling interest in the Derby Gas & Electric.

The Vermont Public Service Commission has approved the petition of the Burlington Traction Company to sell to the Vergennes Power Company its hydro-electric plant at Vergennes, its transmission line from Vergennes to Burlington and other electrical property. Another order gives permission to the Vergennes Electric Company to amend its articles of association by changing the name to the People's Hydro-Electric Vermont Corporation and by increasing the capital stock from $40,000 to $500,000. The increase of $460,000 is for the purpose of buying the hydro-electric plant of the Burlington Traction Company.

The Columbus, Delaware & Marion Electric Company has purchased the plant and lines of the Ashley Light, Heat & Power Company of Ashley, Ohio. A few weeks ago the Columbus, Delaware & Marion Electric Company purchased the Richwood (Ohio) Light, Heat & Power Company. Energy is supplied from the Scioto River power house.

Announcement is made of the sale of the municipal distribution system of Hillsboro, Kan., to the United Power &

Light Corporation of Abilene. Hillsboro formerly purchased power wholesale from the Abilene utility.

The municipal electric light and power plant of the town of Green River, Utah, has been purchased by the Utah Power & Light Company, the transfer becoming effective on Sept. 1. Two hundred customers are served by this plant, which has never been a financial success under municipal ownership.

W. S. Barstow, president of the General Gas & Electric Corporation, announces that the municipal power plant at Umatilla, Fla., has been purchased by the Florida Public Service Company and will be absorbed into the General Gas & Electric system.

The W. B. Foshay Company of Minneapolis is acquiring the Alturas Light & Power Company, the Fort Bragg Light & Power Company and the Mendocino Light & Power Company, in northern California, and will consolidate them as the People's California Hydro-Electric Corporation, which in turn will be controlled by the People's Light & Power Corporation. The public utilities involved in this transfer serve electricity retail to Fort Bragg, Mendocino, Alturas, Caspar, Little River and Albion and wholesale to Cedarville.

HAVANA MERGER APPROVED

The stockholders of the Havana (Cuba) Electric Railway, Light & Power Company have approved a plan to merge the company with Cuban Utilities Company. The new company is to be known as Havana Electric Railway, Light & Power Company. The Cuban Utilities Company, in addition to owning the electric railway systems in Santiago and Camaguey, owned more than 86 per cent of the preferred and more than 98 per cent of the common stock of the old Havana Electric Railway, Light & Power Company. Consequently the merger brings together the electric power and light, gas and railway properties in Havana and the electric railway properties in Santiago and Camaguey.

Working for Harmony Among Wisconsin Companies

A three-cornered agreement is reported to be in the making between the Southern Wisconsin Electric Company, the Public Service Company of Northern Illinois and the Wisconsin Gas & Electric Company, under which the last-named company will take over the electric properties of the Carey Electric Light & Milling Company of Wilmot, serving nearly a score of communities adjacent to the territory served by the three companies above named. Under this agreement, which it is reported from reliable sources will become effective Aug. 15, these companies hereafter will operate in their own specific fields, the Wisconsin Gas & Electric Company serving all of Kenosha County, the Southern Wisconsin Electric Company the town of Bloomfield, while the Illinois utility is to be allowed to operate without competition in the northern part of the state. There have been numerous disputes over territory in southeastern Wisconsin, involving costly litigation.

Duquesne Light Buys Central Plant of Oliver Estate

Rumors that the electric light and power and steam-heating business of the Henry W. Oliver Estate in Pittsburgh was to be transferred by that organization to the Duquesne Light Company and the Allegheny County Steam Heating Company were confirmed on July 28, when it was announced that these allied companies would take over the customers of the estate on Sept. 1 and that additional transmission lines and steam mains would be built to serve them. The agreement calls for the dismantling of the electric generating equipment in the Oliver plant by Feb. 1, 1927, and of the rest of that plant by June 1, 1927. Until those dates the plant will be operated by the new purchasers.

The Henry W. Oliver plant was built in 1903. Besides its steam service it supplies electricity to the Henry W. Oliver Building, the Kaufmann & Baer Building, the McCreery Building, the Women's Exchange Building, the Hardy & Hays Building, the Liberty Avenue Building, the Duquesne Club and two churches and has numerous connections for emergency service. Its territory is the triangle between Smithfield Street, Fifth Avenue and Liberty Avenue. About 1906 the plant was rebuilt to keep pace with the growth of the district, and generating equipment rated at 4,000 kw. was installed. Much further reconstruction has since been done. Approximately 9,000,000 kw.-hr. was generated in 1925, when 630,000,000 lb. of steam was produced.

Briefer News

Valmont Plant Soon to Have Second Unit.—Late in July the Public Service Company of Colorado began the installation of the second unit at its Valmont plant, an addition of 25,000 kw. Its completion will bring the rating of the plant to 45,000 kw. It is expected to have the additional unit in service within sixty days.

Kansas Section, N.E.L.A., Sticks to Convention Place and Date.—Despite the fact that four other conventions are to be held in Manhattan, Kan., at the same time, the executive committee of the Kansas Section, N.E.L.A., determined on Wednesday of this week to hold the annual convention in that city on Oct. 14-16 as originally planned. No hotel is available, but the delegates will be quartered in the gymnasium of the State Agricultural College, and, if necessary, in Junction City, 20 miles away, with special bus and interurban service.

Soon Tired of It.—Terms of the sale of the Milton (Wis.) municipal electric plant to the Wisconsin Power & Light Company for $39,100 have been approved by the Railroad Commission. Municipal ownership and operation was short-lived, the town having only taken over a private company for city operation on Jan. 1, 1926.

Lightning Hits Tennessee Plant.—Lightning struck three transformers at Lebanon, Tenn., belonging to the Tennessee Electric Power Company on July 26, putting them out of commission for several days. Manufacturing plants of the city had to suspend operations until new transformers could be installed.

Central Kansas Power Has Continuous 80-Mile High-Voltage Line.—Completion of a transmission line between Hays and Wakeeney, Kan., now gives the Central Kansas Power Company a continuous stretch of high-voltage line between Russell and Quinter, a distance of approximately 80 miles. The Central Kansas Power Company serves the territory known as the "hard-wheat belt" of Kansas.

Northern Paper Mills Company Drops Fight on Wisconsin's Water-Power Law.—Accepting the terms of the recapture clause of Wisconsin's water-power law, which provision it recently challenged, the Northern Paper Mills Company will soon have work in full swing on the construction of dams and power plants at White Rapids and Chalk Hills on the Menominee River to cost in excess of $2,000,000. As stated previously in the ELECTRICAL WORLD, the constitutionality of the recapture clause is to be carried to the United States Supreme Court by other contestants.

Watertown, N. Y., Votes for Extension of Municipal Service.—The special election at Watertown, N. Y., on July 27 on bond issues to further the development of municipal electric power showed a majority in favor of all the three proposals submitted. The total amount voted was $423,000, divided as follows: $252,000 to complete the existing power house and development and $171,000 to complete the municipal street-lighting system. The third vote was in favor of the city's asking the Public Service Commission for permission to engage in commercial lighting.

New Lines in Texas Panhandle to Cost $1,000,000.—An extension of its power transmission system in the Texas Panhandle is to be made by the Southwestern Public Service Company of Carlsbad, N. M., at a cost of approximately $1,000,000. One of the new high-tension lines is to be run from Amarillo to Pampa by way of Panhandle City and White Deer, 60 miles. The oil field in Hutchinson and adjoining counties is also to be connected up by means of a power system. It is expected that electricity will be adopted for general use in drilling wells and other oil-field operations. The company has under consideration the construction of an additional power plant.

Turlock Irrigation District Power Project.—That the hydro-electric power project planned by the Turlock Irrigation District of California will cost $5,500,000 was revealed July 12 when the district filed an application with the State Division of Water Rights to divert water from the Tuolumne River and Moccasin Creek. The district asks authority to use 1,200 sec-ft. of water in

generating 27,000 theoretical horsepower. The diversion point will be near Jacksonville. Electrical energy will be wholesaled to the San Joaquin Light & Power Company for distribution in Stanislaus County.

Los Angeles Must Answer Southern California Edison's Complaint.—In the Superior Court at Los Angeles July 26 the demurrer in the action of the Southern California Edison Company against the city of Los Angeles to recover judgment for a power bill amounting to $840,155, which the plaintiff alleges to be overdue, was overruled. (See ELECTRICAL WORLD for July 3, page 31.) The city will now be obliged to file an answer.

Into the Fold.—Two more Michigan towns have abandoned their outgrown municipal electric plants and granted franchises to utility companies operating in their neighborhoods. They are Melvin, Sanilac County, and Frankenmuth, Saginaw County. A total of 85 Michigan communities which formerly operated their own lighting plants are now tied into central-station systems. The vote in Melvin for service from the Michigan Electric Power Company was unanimous. At Frankenmuth only two were against selling the plant to the Consumers Power Company.

New England Power Negotiating for Hydro Sites.—The New England Power Company is said to be negotiating with the Connecticut Valley Lumber Company with a view to buying a large part or all of the stock of the latter company. The probable selling price of the Connecticut Valley Lumber Company, which has been inactive for several years, is about $10,000,000. It has valuable water and power privileges in the upper part of the Connecticut Valley and is controlled by E. S. Webster, Charles A. Stone, James J. Phelan and Henry Hornblower. The company has 330,000 acres of timber lands in northern New Hampshire and northern Vermont and has timber property in Canada.

Continuous Transmission Lines Now Reach from St. Louis to Boston.—With the completion last month of a section of 12 miles of high-tension transmission line between Ellwood City and New Brighton, Pa., another long stretch of interconnected transmission lines was made complete, this time joining St. Louis and the Mississippi Valley with Boston, though, of course, no very long-distance exchange of power is contemplated or practically possible. The closing of the final link was celebrated by the Duquesne Light Company of Pittsburgh, and the Pennsylvania-Ohio Power & Light Company of Youngstown. James M. Graves, vice-president of the former, and C. S. MacCalla, vice-president of the Ohio company, formally placed the line in commission. The Duquesne Light Company is connected with the Pennsylvania-Ohio company on the north and west. On the south and east the Duquesne system is tied in with the interconnected lines of the West Penn Power Company. Those in turn have interconnections with the remainder of the chain.

Water Shortage at Fredericksburg, Va.—Low water in the Rappahannock River, resulting from an extended dry period, has caused a shortage of electric power at Fredericksburg, Va., and several large consumers have recently been forced to curtail their operations. No water came over the dam above the city for several days, and the Virginia Electric & Power Company did not have sufficient flow to run its hydro plant at full capacity. The situation was ameliorated by bringing into service oil-engine auxiliary equipment.

Lake Chelan Power Project in Full Swing.—The Washington Power Company is gradually crowding toward maximum speed the work on the hydro-electric project at Lake Chelan, Wash. Five hundred men are working at six tunnel borings. Construction work for the dam in the Chelan River at the town of Chelan will start in September at low-water period and will be completed by March of next year. The initial development is for two generating units of 34,000 hp. each, with an ultimate capacity of 125,000 hp. to 130,000 hp., at a total cost of $10,000,000.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

Association of Electragists International—Hotel Breakers, Cedar Point, Ohio, Aug. 24-27. L. W. Davis, 15 West 37th St., New York.

Camp Co-operation VI (local leagues)—Association Island, Henderson Harbor, N. Y., Sept. 1-4. (Society for Electrical Development, New York, is sponsor.)

Wisconsin Utilities Association, Electric Section—Eau Claire, Wis., Sept. 3 and 4. J. N. Cadby, 445 Washington Bldg., Madison, Wis.

American Institute of Electrical Engineers—Pacific Coast Convention, Hotel Utah, Salt Lake City, Sept. 6-9. F. L. Hutchinson, 33 West 39th St., New York.

Illuminating Engineering Society—Essex and Sussex Hotel, Spring Lake, N. J., Sept. 7-10. L. H. Graves, 31 West 46th St., New York.

Rocky Mountain Division, N. E. L. A.—Glenwood Springs, Col., Sept. 13-16. O. A. Weller, Public Service Co., Denver.

New England Division, N. E. L. A.—Poland Spring House, Poland, Me., Sept. 21-23. Miss O. A. Bursiel, 149 Tremont St., Boston.

International Association of Municipal Electricians—Battery Park Hotel, Asheville, N. C., Sept. 21-24. E. H. Benz, West New York, N. J.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 23-25. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Edison Illuminating Companies—Chateau Frontenac, Quebec, Sept. 27-Oct. 1. P. S. Millar, 80th St. and East End Ave., New York.

Public Utilities Association of West Virginia—Charleston, W. Va., Oct. 1 and 2, A Bliss McCrum, secretary.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 4 and 5. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Cleveland, Oct. 4-8. J. W. Welsh, 292 Madison Ave., New York.

American Electrochemical Society—Hotel Washington, Washington, Oct. 7-9. C. G. Fink, Columbia University, New York.

Kansas Section, N. E. L. A.—Manhattan, Kan., Oct. 14-16. H. Lee Jones, 401 National Reserve Bldg., Topeka, Kan.

Memphis to Get Next Southeastern Association Convention.—At an executive session held recently, Memphis, Tenn., was chosen as the meeting place of the fifteenth annual convention of the Southeastern Division of the National Electric Light Association, which will open on April 13, 1927. An unusual feature of this convention will be a manufacturers' exhibit. This exhibit will be held in the same building in which the meetings are held and will be the first ever conducted in connection with a meeting of the Southeastern Division.

Highly Rated Synchronous Condensers for Southern California Edison.—Synchronous condensers said to be of far greater capacity than any ever previously built have been ordered by the Southern California Edison Company for regulating the voltage along the transmission lines which carry power from remote hydro-electric developments into Los Angeles. Each of the three condensers, which are being built by the General Electric Company, is rated at 50,000 kva., 13,200 volts, 50 cycles, 600 r.p.m. Two are to be installed in the new Lighthipe substation and the other in the Eagle Rock substation. The largest synchronous condensers previously constructed by the General Electric Company have a capacity of 30,000 kw. each and are in use in the Laguna Bell and Eagle Rock substations of the Southern California Edison Company. For each condenser the manufacturing company is supplying three transformers. These nine units are of 16,700 kva. rating and have 73,000-volt primary and 13,000-volt secondary windings.

General Electric Directors Pass Resolution on Death of Former Head.—The board of directors of the General Electric Company at the first meeting held after the death of C. A. Coffin adopted the following memorial resolution: "Charles Albert Coffin was the founder of the General Electric Company and throughout his life its leader. His spirit was its inspiration. He had unfaltering courage in trying times. He had modesty and self-restraint in the days of great success. He developed an art and built an industry so that his company might succeed and his country prosper. No man could do this without force and tact and sympathy. No man could do it without the capacity to select and the personality to stimulate other men. No man could do it without that modesty in his own achievements which represents the highest generosity to his associates. Truly, if an organization may be a monument to a man, then this company is a monument to him. Some of the members of this board have been associated with Mr. Coffin throughout the life of the organization, and others are indebted to him for their opportunity. For themselves and for every member of the organization, in whatever capacity, they record their gratitude, their appreciation of his service and their sorrow."

Men of the Industry

Dr. Millikan Recipient of A.S.M.E. Medal

Robert A. Millikan, to whom was presented the A.S.M.E. medal at the recent meeting of that society in San Francisco, as announced in the July 10 issue of the ELECTRICAL WORLD, has been executive head of the California Institute of Technology since 1921. This latest honor conferred on Dr. Millikan is another acknowledgment of his outstanding achievements, which have

R. A. MILLIKAN

frequently in the past won the recognition of the scientific and engineering world. His laurels have included the Edison medal of the American Institute of Electrical Engineers, the Hughes medal of the Royal Society of Great Britain, the Nobel prize of the Swedish Academy and the Faraday medal of the London Chemical Society. Dr. Millikan's most noteworthy work probably consists in his researches into the nature of the electron. These have been of inestimable scientific value.

Dr. Millikan was born in Morrison, Ill., in 1868 and was graduated from Oberlin College in 1891. Subsequently he received degrees from Columbia University, the University of California, Northwestern University, University of Pennsylvania, Amherst College and from Berlin, Göttingen and Dublin. He taught physics at Oberlin in 1891 and from there went to the University of Chicago, where he became assistant professor of physics in 1901, associate professor in 1907 and professor in 1910. It was in 1921 that he removed to the Pacific Coast to direct the Norman Bridge Laboratory of Physics at the California Institute of Technology and to serve as chairman of the executive council.

Gustav F. Wittig, formerly assistant professor of electrical engineering at Yale University, has joined the staff of the ELECTRICAL WORLD in the capacity of statistical editor to succeed R. M. Davis. A native of New Brunswick, N. J., and a graduate of Rutgers and of Columbia, Mr. Wittig has combined in his professional career teaching and practical work. He has been associated with the teaching staff of the University of Maine and the University of Alabama and for the last eight years with Yale. In Alabama he organized the course in electrical engineering which at the time of his coming had recently been established and carried it through the period of rapid growth paralleling the initial stages of electrical power development in the state. Meanwhile he was associated with two of his colleagues in engineering practice under the name of Davis, Wittig & Gallalee. Mr. Wittig has been a regular contributor to the "Digest of Electrical Literature" section of the ELECTRICAL WORLD. His connection with the statistical studies of the electrical industry is not new. Soon after leaving Columbia he became a member of the statistical department of the old Westinghouse, Church, Kerr Company in New York and remained in that capacity until the fall of 1906.

J. R. Kearney Organizes New Corporation

James R. Kearney, a well-known figure in the electrical world, has organized the James R. Kearney Corporation at St. Louis to manufacture overhead and underground utility equipment. For many years Mr. Kearney was associated with the W. N. Matthews Corporation. Previous to joining the Matthews organization he was with the Topeka (Kan.) Edison Company. His practical experience in working from groundman and lineman to chief construction engineer has given him an intimate acquaintance with technical problems.

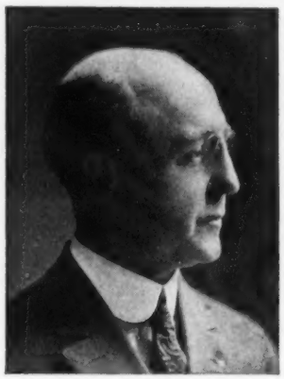
Mr. Kearney joined the Matthews organization as a salesman. At the time of his resignation he was manager of electrical sales in the United States, Canada, Mexico and Cuba. Because of his long and practical experience in the electrical industry, Mr. Kearney is

J. R. KEARNEY

recognized as an authority on pole-line and underground construction, plant engineering and specialty equipment manufacturing. Associated with Mr. Kearney is a group of well-known engineers and prominent financiers.

B. J. Denman President of New United Light Subsidiary

B. J. Denman, who was named president of the United Ohio Utilities Company, the new subsidiary of the United Light & Power Company, as announced in the July 24 issue of the ELECTRICAL WORLD, has been associated with the United Light & Power Company or its subsidiaries since 1913, when he became president of the Tri-City Railway & Light Company at Davenport, Iowa. He has continued to occupy this position up to the present time, being, in addition, vice-president and general manager of the parent organization, the United Light & Power Company, as



B. J. DENMAN

well as an officer and director of many of the other subsidiary properties. Mr. Denman's early experience was in the electric railway field, but in 1904 he entered the employ of the Detroit Edison Company. After engaging in operation, construction, appraisal work and cost accounting and serving in the capacity of chief engineer, he severed his connection with that utility to become chief executive of the Tri-City Railway & Light Company.

Mr. Denman is a graduate of the University of Michigan, where he served as assistant professor of mechanical engineering and non-resident electrical engineering lecturer on power plants, substations and railway engineering. He is a member of the American Institute of Electrical Engineers and also of the American Society of Mechanical Engineers.

Robert M. Davis, statistical editor of the ELECTRICAL WORLD since 1919, has been promoted to be statistical adviser of the McGraw-Hill publications. His broad knowledge of engineering and his varied experience in making statistical studies eminently qualify him for his new position as consultant for all the McGraw-Hill papers. Prior to joining the staff of the ELECTRICAL WORLD, Mr. Davis was for several years identified with the United States Geological Survey, engaging in engineering and statistical work in connection with water-power development. He is a graduate of the College of Civil Engineering of Cornell University, class of 1907.

Allen M. Perry, Western editor of the ELECTRICAL WORLD, with headquarters in Chicago, is now well on the road to recovery after an operation for appendicitis.

E. G. Lee, formerly chief designing engineer and assistant to the chief engineer of the Central Maine Power Company, has joined the hydraulic division of Stone & Webster, Inc.

J. Walton Peart, who for fourteen years has been chief engineer of the Public Utilities Commission at London, Ontario, resigned July 31 to become manager of the Hydro-Electric Commission at St. Thomas, Ontario.

H. N. Carlson, formerly of the Massachusetts Institute of Technology and Wentworth Institute, is now associated with the R. H. Baker Company, Inc., Cambridge, Mass., as engineer of construction and design.

Herbert S. Sands, manager of the industrial division of the Westinghouse Electric & Manufacturing Company at Denver, Col., and a vice-president of the American Institute of Electrical Engineers, has received the degree of electrical engineer from the University of Colorado in recognition of the merits of a thesis he prepared entitled "The Electrical Engineer in Industry."

Dr. W. D. Coolidge, assistant director of the research laboratory of the General Electric Company and inventor of an X-ray tube which bears his name and is universally used in hospitals and laboratories, has been awarded the Howard N. Potts gold medal for 1926 by the Franklin Institute of Philadelphia. The medal, to be formally presented by the institute on Oct. 20, is "in consideration of the originality and ingenuity shown in the development of a vacuum tube that has simplified and revolutionized the production of X-rays," according to the institute's citation. In accepting the medal, Dr. Coolidge will present a paper on his new and powerful cathode-ray tube.

Albertson and Kalweit Officers of New Holding Company

Walter N. Albertson, president and general manager of the newly organized Central West Public Service Company, a holding company for the operation and management of a score of utility companies in Iowa, Nebraska, North and South Dakota, has been a prominent figure in engineering circles in Wisconsin and other neighboring states for many years. Practically all of Mr. Albertson's business career has been devoted to the electrical field. He has his own electrical engineering business and was general manager of the Badger Public Service Company, Plymouth, Wis., a North American property.

Mr. Albertson was born in Burlington, Wis., in 1888. On leaving school he entered the employ of the Milwaukee Electric Railway & Light Company as a general helper in the meter and testing department. His promotion was rapid, and he had progressed to the post of assistant electrical engineer by 1910, at which time he left the Milwaukee utility to serve the Central Illinois Public Service Company at Mattoon, Ill. He remained with this company for only six months, during which he was in charge of plant-rebuilding operations.

In 1911 Mr. Albertson returned to Milwaukee and organized the firm of W. N. Albertson & Company, electrical engineers. He was responsible for the establishment of one of the most complete electrical engineering institutions in the Middle West. This included

W. N. ALBERTSON

a public utility inspection bureau, which was conducted in conjunction with the Railroad Commission for the inspection of public utilities, and a shop and maintenance department in Milwaukee for the rebuilding of high-tension transformers, switchboard instruments, meters and generators, together with other power-plant equipment.

George W. Kalweit, who resigned from the post of general auditor of the Milwaukee Electric Railway & Light Company to join forces with W. N. Albertson as vice-president and treasurer of the newly organized Central West Public Service Company, as announced in the July 17 issue of the ELECTRICAL WORLD, is especially fitted to perform the duties required in his new work because of his long and broad experience in the field of accounting, to which end of the business nearly his entire business career has been devoted. Mr. Kalweit was born in Berlin, Germany, in 1880 and came to the United States at the age of six years, settling in Milwaukee. Upon completion of his education in the schools of Milwaukee he entered the employ of the Milwaukee

G. W. KALWEIT

Electric Railway & Light Company, and after frequent promotion he was made auditor on Jan. 1, 1907. He continued to act in that capacity until March 1, 1916 when he was appointed general auditor of the Milwaukee Electric Railway & Light Company. This office he filled until he resigned to take over his new duties with the Milwaukee holding company.

Obituary

Louis Henry Junod, Consul General for Switzerland and head of L. H. Junod & Company, agents for Landis & Gyr, Ltd., of Zug, Switzerland, manufacturers of electrical meters, died suddenly at his home in New York, Aug. 3, in his sixty-fifth year. In addition to representing Landis & Gyr, he was the selling agent for several other Swiss firms. A native of Neuchatel, Switzerland, Mr. Junod became interested in the American trade of Swiss manufacturers. In his twenty-second year he came to the United States as the representative of Steiger & Company, manufacturers of laces and embroideries, and so successful was his busniess that Mr. Junod decided to make his permanent home in New York, where he organized L. H. Junod & Company.

J. J. Sigg, veteran electrical engineer of the Winston-Salem branch of the Southern Public Utilities Company, died July 10, following an illness of several months. Mr. Sigg became superintendent of plant and lines and of the street railway when with the Fries Manufacturing & Power Company, which at that time owned and operated the electric and railway utilities at Winston-Salem. When the Southern Public Utilities Company purchased the utility properties at Winston-Salem he retained his old position and served continuously with the company until his death. Mr. Sigg was a native of Switzerland and first came to America in 1874. After completing a three-year course in electrical engineering in the Franklin Institute he entered the employ of the General Electric Company at Fort Wayne, Ind., resigning subsequently to remove to Winston-Salem.

Frederick J. W. Luck, for many years prominent in the engineering counsels of the Westinghouse Electric International Company in various countries, died in London, England, July 12. Mr. Luck's death followed a protracted illness that he contracted while in Brazil. To the electrical development of that nation he contributed largely. While working as an engineer in Madrid in 1902, Mr. Luck was engaged by the Société Anonyme Westinghouse as technical adviser to the sales manager for Spain and Portugal. He later was appointed manager for Spain and Portugal, representing the Société Anonyme Westinghouse in both countries. In the fall of 1905 he was sent by the Westinghouse Electric & Manufacturing Company to Rio de Janeiro. During his long stay in Brazil Mr. Luck designed and was responsible for the installation of many of the important power plants there. He was transferred from Brazil to the London office of the Westinghouse Electric International Company in September, 1923, and was retired in July, 1924. Mr. Luck was a fellow of the American Institute of Electrical Engineers.

Commission Rulings

Making Power Factor a Component of Rates.—A power-factor clause in an electric rate schedule, based on the theory of conserving energy lost in transmission by rewarding or penalizing consumers as their use of the power factor varies above or below 80 per cent, was held by the Wisconsin Railroad Commission, in a case affecting the Wisconsin Public Service Corporation, to be reasonable when the application, in connection with a reduced energy rate, would result in more decreases than increases in bills of consumers having a billing demand of 200 kw. a month, although the bills would be increased of those having a lesser billing demand whose power factor was not 80 per cent, where it was probable that with only a small expenditure a majority of the consumers adversely affected could improve the power factor so as to decrease the bills. The commission observed: "The choice of 80 per cent as the boundary power factor appears reasonable, inasmuch as the experience of many electric utilities indicates that the average power factor which most customers with proper equipment might maintain is 80 per cent or higher. . . . Many utilities have power-factor clauses incorporated in their rate schedules which penalize the user who operates his equipment at a power factor below that of the system —usually 80 per cent. The applicant proposes to go a step further and reward the customer who maintains a power factor higher than 80 per cent. This seems fair and reasonable, since for the same power requirement fewer kilovolt-amperes need be generated if the power factor is above 80 per cent, just as a greater number of kilovolt-amperes must be generated if the power factor falls below 80 per cent. It appears reasonable to assume that with a premium allowed a customer for good power-factor conditions, those customers who are shown to have poor power factors will improve the power factor of their loads further."

Accrued Depreciation and Operating Efficiency.—Allowance should be made for the depreciated condition of property in ascertaining the reproduction cost, nothwithstanding that the property may be rendering service at 100 per cent efficiency. This was the opinion of the Idaho Public Utilities Commission *in re* Boise Water Company. The commission said: "The condition of utility property today may be such as to enable it to render service at approximately 100 per cent, but its condition tomorrow may be such that it will be unable to render such service. Where property is rendering service at approximately 100 per cent, it is self-evident that its condition is then such as to render such service. This is judging the condition of the property from the service which it is rendering. Judging the physical condition of property from the service it is rendering limits the judgment based thereon to the service condition of the property at the time of the rendering of the service and supplies little, if any, evidence upon which to base a determination as to the amount of unused service in such property. Generally speaking, operating property renders fairly good service until it stops."

Should Commission Add Valuation for Intangibles Not Asked by Applicant?—The Montana Railroad and Public Service Commission conducted on its own initiative an inquiry into the reasonableness of the rates of the Union Electric Company of Dillon. The valuation submitted by the company did not include any allowance for going-concern value, working capital, organization expense or any other intangibles. At the hearing the owner and manager of the plant responded that he had no cause to show why rates should not be reduced, but in a brief filed after the hearing criticism was made of the valuation for failure to include an allowance for going-concern value. The commission stated that "there may be instances in rate cases where it is proper for the commission to assume the role of guardian over public utility properties whose operators possess little or no knowledge of rate-making problems, and in such cases the commission is perhaps justified in including allowance for these items when they are not claimed. But here the situation is different. The owner and manager of the plant at Dillon is one of the foremost electrical engineers in the western part of the United States. He has had a lifetime of experience in the organization, construction and operation of public electric utilities. Under the circumstances we are entitled to assume that unless he makes specific claim for values none in fact exists."

Recent Court Decisions

Employee Attempting to Remove Fallen Electric Wires Despite Employer's Protest Is Contributorily Negligent.—In Gibson's Administrator vs. Ohio Valley Electric Railway Company, the Court of Appeals of Kentucky held that a mine employee who was killed while attempting against the protest of his employer to remove from a mine track live electric wires that had been knocked down by a falling tree in a storm was guilty of contributory negligence, since there was no sudden emergency or danger necessitating such action. The court therefore upheld a directed verdict for the defendant, which owned the wire and supplied energy to the mine, irrespective of evidence that it was negligent in not properly insulating its wires and in permitting a tree alleged to be rotten to stand beside them. (283 S. W. 415.)*

Rate-Fixing Limitation of Municipally Owned Plants in Colorado.—The city of Wiley, Col., contracted with the Lamar Electric Company for power at certain rates, this contract still being in force when the company's plant was purchased by the city of Lamar and an increase in rates to Wiley was attempted. The Colorado Public Utilities Commission forbade a raise in rates, but the city insisted that the commission had no jurisdiction over a municipal plant. The Colorado Supreme Court has now decreed that while the commission has no power to fix rates within the corporate limits of a city that owns its own power plant, the commission has jurisdiction when the company seeks to serve outside of said limits. The commission has no jurisdiction over the rates charged to the citizens of Lamar because these citizens are, in the last sense, the rate-making power themselves; but, since the citizens of Wiley have no voice in the choice of Lamar city officials, the Public Utilities Commission, as an agency to enforce justice, has the power of rate control there. The former contract is not binding upon Lamar, the court said, but Wiley can file at any time a complaint against the rates now charged and the commission can, after a hearing, readjust them.

Federal Court on Adequacy of Depreciation Reserve and Other Points.—Reaffirming the principles of valuation established by the United States Supreme Court concerning cost of reproduction new less depreciation, the United States District Court in Washington State (in Pacific Telephone & Telegraph Company vs. Whitcomb, and Home Telephone & Telegraph Company of Spokane vs. Denney) defined depreciation as "that diminution in the value of the property involved which takes place in the physical thing and is ascertained by physical inspection of it—not the future depreciation which inevitably comes about by wear, tear, obsolescence and the like." The rate-making body has, the court said, no authority to reduce what it considers an excessive depreciation reserve fund by making inadequate provision for future depreciation. Other utterances by the federal court follow. Going-concern value is, it said, properly held to rest largely on competent or expert opinion, and the defendant cannot complain of the amount accepted by a special master as going value where the opinion of its expert was used. The company was not bound to appeal to the state courts before bringing suit against the Department of Public Works in the federal court, despite a state statute to that effect, particularly where it was obvious that an appeal to the State Supreme Court would be useless because of a prior deliverance by that body. A return of less than 7½ per cent was properly held confiscatory, and in enjoining the enforcement of confiscatory rates a federal court is not engaged in the task of fixing rates. Outlays of public utility companies for equipment in anticipation of reasonable future needs are essentially a matter of business management and must not be arbitrarily interfered with under the guise of rate making. (12 Fed. (2d) 279.)

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*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Financial and Corporate

Utility Market Rallies

Substantial Gains Registered by Leading Issues as Consolidated Gas Advances

SENSATIONAL advances in the two leading industrial stocks listed on the New York Stock Exchange—General Motors and United States Steel common—were not accompanied by similar gains in the power and light group, but even in the latter section the advances outnumbered the declines. Continued favorable reports on earnings by several leading industrial companies were interpreted as an indication of improving business, and this was reflected in rising prices for the utility shares.

While none of the listed utility stocks rose in degree with General Motors, which jumped to above 210, and Steel common, which crossed 150, significant advances were shown by Consolidated Gas, which rose nearly seven points during the week under review. An advance of five points was made by the stock of the American Water Works & Electric Company, of four and one-half by the North American Company, of three and one-quarter by the American Power & Light, of two and seven-eighths by the Columbia Gas & Electric, and better levels were reached in Public Service Corporation of New Jersey.

In the unlisted market strength was shown by Northern States Power, Electric Investors, Inc., Commonwealth Power, which reported record earnings for the six months' period; American Gas & Electric and American Light & Traction. United Gas Improvement improved its position by about three points in the week.

Indiana Company Plans Large Bond Issue

Authority to issue 40-year first and refunding mortgage gold bonds was sought by the Northern Indiana Public Service Company in a petition filed Aug. 2 with the Indiana Public Service Commission, the new offering to involve a total of $12,500,000. A petition was also filed asking authority to issue $4,000,000 of the first lien and refunding mortgage 6 per cent gold bonds of the Northern Indiana Gas & Electric Company, which was recently merged into the Northern Indiana Public Service Company. As a result of this proposed new financing the Public Service Company will retire $4,500,000 of three-year notes, due June 1, 1927, thus releasing $5,000,000 of Northern Indiana Gas & Electric first lien and refunding mortgage gold bonds, pledged as security.

New Capital Issue.—First mortgage and refunding 20-year 5½ per cent sinking-fund gold bonds, series A, of the Jersey Central Power & Light Company have been offered the investing public, the price being 98 and interest, to yield over 5.65 per cent. Proceeds will be used to reimburse for expenditures on improvements and for construction.

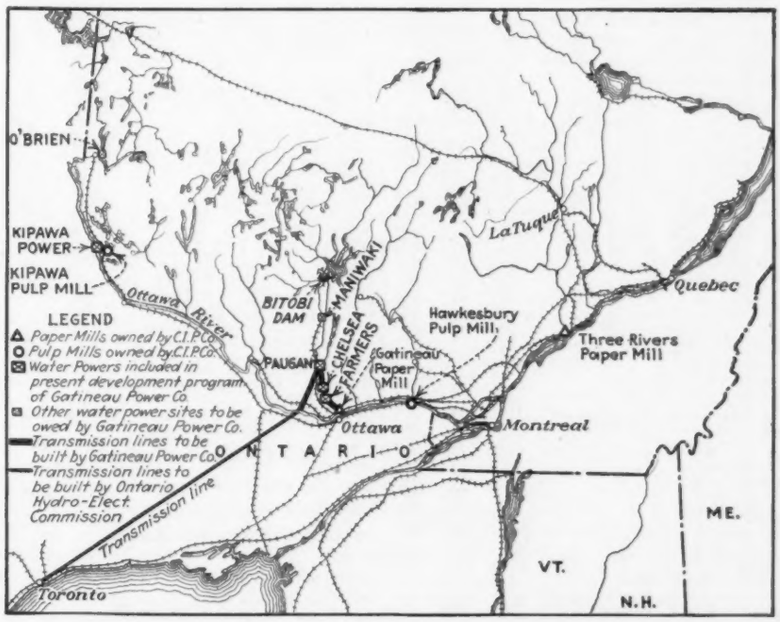
General Electric New Stock Replaces Old.—The old shares of the General Electric Company, the basis of many present-day Wall Street fortunes, have been stricken from the list of the New York Stock Exchange. The old issue has been replaced by the new General Electric shares, resulting from the recapitalization of the corporation voted by the directors on May 11, under which holders received four shares of new stock for every one of the old. The last quotation for the old stock, which was on Saturday, July 31, was 356.

International Paper Develops Gatineau

Gatineau Power Company's Project Will Have an Initial Capacity of 397,500 Hp., and Already It Has Sold Most of Its Anticipated Power

BY PAUL WILLARD GARRETT
Financial Editor *New York Evening Post*

FLOTATION of an issue of first mortgage 5 per cent bonds to the amount of $25,000,000 and an issue of gold debentures to the amount of $12,500,000 recently by the Gatineau Power Company, a Quebec corporation owned entirely by the International Paper Company, marks the early steps in the financing of a huge development that will not be completed until the fall of 1928. Under the direction of the International Paper Company the company is developing four hydro-electric plants that will have an initial installed capacity of 397,500 hp., of which 373,500 hp. will be on the Gatineau River. That will make the Gatineau project one of the largest of its kind in the world. Only two hydro-electric systems in this country exceed in capacity the installation planned for Gatineau. Contracts for the sale of more than 90 per cent of the primary power to be generated by these four plants have already been awarded to the Hydro-Electric Power Commission of Ontario, Canadian International Paper Company and Canada Cement Company, Ltd., Montreal- Que.



PROPERTIES OF CANADIAN INTERNATIONAL PAPER COMPANY AND WATER POWERS OF GATINEAU POWER COMPANY

Upon completion of the present program of financing, the Gatineau Power Company will have outstanding the newly issued $25,000,000 of first mortgage bonds due in 1956 plus $12,500,000 to be issued and held in escrow, or $37,500,000 altogether; the $12,500,000 of 6 per cent sinking-fund debentures due in 1941, just issued, and two issues of capital stock. Both the $25,000,000 of 6 per cent cumulative preferred stock and the 500,000 shares of common stock issued are owned in their

entirety by the International Paper Company.

A. R. Graustein, president of the Gatineau Power Company, says: "Upon completion of all four power plants and the delivery of the ultimate amount of power under the contract with the Hydro-Electric Power Commission of Ontario, it is estimated that net earnings of the company available for interest and reserves will exceed $5,400,000 per annum, or almost three times the annual interest requirements on the entire $37,500,000 first mortgage gold bonds issuable against the initial construction program, and that the 30-year contract with the Ontario Hydro-Electric Commission will alone produce annual net earnings for interest and reserves over one and eight-tenths times such interest charges." Arrangements have been made to guarantee the completion of the project, and the International Paper Company itself undertakes to guarantee enough funds, if any additional are needed, to carry through the proposed development.

Offered at 94 to yield more than 5.4 per cent to maturity, the Gatineau Power Company's first mortgage bonds were immediately oversubscribed by investors. Not only did the Gatineau project appear to be an economical development to investors, but the plants will be located near an excellent market for the disposal of the energy. It will be possible to dispose of roughly 70 per cent of the power for public utility purposes alone. The Gatineau project is situated within transmission distance of almost every important community in Quebec and Ontario, which is to say that the company's potential power market includes the territory containing about half of the population and five-sixths of the manufacturing plants of the Dominion.

Dividends Declared

Name of Company	Per Cent	When Payable
American Superpower, ptc. pf.	$.50	Aug 16
Brooklyn Edison	2	Sept. 1
Charlestown Gas & Electric	$1.25	Aug. 2
Charlestown Gas & Electric, extra	.25	Aug. 2
Consolidated Gas (N.Y.) com	$1.25	Sept. 15
Duquesne Light, 7% pf	1¾	Sept. 15
Engineers Publ. Serv., pf.	$1.75	Oct. 1
North American Edison, pf.	$1.50	Sept. 1
Philadelphia Company, 5% pf.	$1.25	Sept. 1
Tampa Electri , com	.62½	Aug. 16
Washington Water Power, 6½% pf.	1⅝	Sept. 15
White (J. G.) & Co., pf.	1½	Sept. 1
White (J. G.) Engineering, pf.	1½	Sept. 1
White (J. G.) Man'g't. Corp. pf.	1¾	Sept. 1

Electrical Manufacturing Companies Report Earnings

For the six months ended June 30, 1926, the Maytag Company reported net profits of $3,073,683 after expenses, federal tax reserves and other charges, which is equal to $1.92 a share on the 1,600,000 shares of no-par stock outstanding. An analysis of the statement reveals that the second quarter was considerably better than the first three months of the year, the net profit for the three months ended June 30 being $1,657,274, equal to $1.03 a share, as compared with $1,416,410, or 89 cents a share, in the first quarter of 1926. During the second quarter the balance sheet as of June 30 revealed a net working capital of $4,581,944 as compared with a working capital of $3,937,047 as of March 31.

The Eureka Vacuum Cleaner Company reports for six months ended June 30, 1926, net profit of $786,799 after expenses and federal taxes, equal to $3.14 a share earned on 250,000 shares of no-par capital stock. This compares with $541,975, or $2.16 a share, in the first half of 1925. Net profit for second quarter of 1926 totaled $346,360, or

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 3	Low 1926	High 1926
ABITIBI PWR. & PAPER, com. —no par	80	70¼	84¼
Adirondack Pwr. & Lt.—7% pf.	107	....	....
Adirondack Pwr. & Lt.—8% pf.	113	....	....
Ala. Pwr., pf.	105	....	....
Allis-Chalmers Mfg. pf.	110	105	110½
Allis-Chalmers Mfg., com.	90	78¼	94¼
Aluminum Co. of Amer., com.	68¼	54¼	76
Aluminum Co. of Amer. new, pf.	k101½	98¼	101½
Amer. & Foreign Pwr., pf. 25% pd.	k110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	91¾	89	98
Amer. & Foreign Pwr., com.—no par	21¾	15¼	42¼
Amer. Bosch Magneto, com—no par	21	16	34¼
Amer. Brown, Boveri, Elec.	40¼	30¼	48¼
Amer. Brown, Boveri, Elec., pf.	k 95¼	86¼	97¼
Amer. Elec. pwr , pf.	m111	102	111
Amer. Gas & Elec., 6% pf.—no par.	95½	90½	95¾
Amer. Gas & Elec., com.—no par...	99¼	64	99½
Amer. Lt. & Trac., 6% pf.	107	101	108
Amer. Lt. & Trac., com.	224	195	263
Amer. Pwr. & Lt., 6% pf.	96½	92	97
Amer. Pwr. & Lt., com.—no par....	69¼	45	80
Amer. Pub. Serv., 7% pf....	k 93	92	97½
Amer. Pub. Serv., com	50	45	80
Amer. Pub. Utilities, 6% pf.	85	....	....
Amer. Pub. Utilities, 7% pf.	94¾	89	96
Amer. Pub. Utilities, com.	79	....	....
Amer. States Sec., A	3½	....	....
Amer. States Sec. B	2¼	....	....
Amer. Superpwr., pf.—25	25¼	23	26¼
Amer. Superpower, pf.	93	....	....
Amer. Superpwr., Class A—no par..	30½	19½	37½
Amer. Superpwr., Class B—no par..	31¼	21¼	39
Amer. Wtr. Wks. & Elec., 7% pf.	106	101½	108½
Amer. Wtr. Wks. & Elec., com.—20.	62	43¾	74
Anaconda Copper	50¾	41¼	51
Appalachian Pwr., 7% pf.	98	99	101
Appalachian Pwr., 1st pf., 7%	98	99	101
Appalachian Pwr., com.	78	77	83
Arizona Pwr., 7% pf.	m 70	....	....
Arkansas Cent. Pwr., pf., $7—no par	k104	99	107
Arkansas Lt. & Pwr., 7% pf.	101	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	k105½	100½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	84	....	....
Assoc. Gas & Elec., Class A—no par	34¼	25½	35½
BABCOCK & WILCOX, com.	119	....	....
Birmingham Elec. pf.—$7—no par...	104½	....	....
Blackstone Valley Gas & Elec., pf...	103	103	106
Blackstone Valley G.&E., com.—50.	k 98	....	....
Blaw-Knox, com.	¢ 59½	45	60
Brazilian Trac., Lt. & Pwr., com...	f101½	....	....
Broad River Pwr., pf.	94¼	....	....
Brooklyn Edison, com.	149	133	149½
Buffalo, Niagara&East.Pwr.,pf.—25.	24¾	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par	30½	....	....
CALIFORNIA ELEC. GENERATING, pf.	92½	89	95
California Ry. & Pwr., pf.	90	88	115
Carolina Pwr. & Lt., pf.—$7—no par	108½	....	....
Cent. & S. W. Ut. 7% pf.—no par	a 94	89½	96½
Cent. & S. W. Ut., pr. In. pf.—no par	a 94¼	93	100
Central Ariz. Lt. & Pwr., pf.	103	....	....
Central Ark. Ry. & Lt., 7% pf.	k 98	99	99½
Central Ill. Pub. Serv., 6% pf.	k 88	89	91
Central Ind. Pwr., 7% pf.	85	85	93½
Central Pwr. & Lt., pf.	97½	....	....
Central States Elec., 7% pf.	90	....	....
Central States Elec., com.	m200	200	230
Century Elec., com	m115	110	116
Chicago Fuse Mfg., com., no par...	m 31½	30	35
Cincinnati Gas & Elec., com.	g 89¼	88	95
Cities Service, 6% pf.	l 86¼	82¼	86½
Cities Service, pf.B—10.	i 7¼	7¼	7¼
Cities Service, pf. BB—100.	l 74	74	79
Cities Service, com.—20	l 41¼	37¼	42½
Cities Service, Bks. Shrs.—10.	l 20¼	19¼	20¼
Clarion River Pwr., pf.	93	93	95
Cleveland Elec. Illg., 6% pf.	107½	....	....
Cleveland Elec., Illg., com.	k295	240	310
Colorado Pwr., 7% pf.	k 95	96	97
Columbia Gas & Elec., 7% pf.	115½	112	115½
Columbia Gas & E., com.—no par.	85¼	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104	....	....
Columbus Elec. & Pwr., com.	250	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	99	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93½	....	....
Col. Ry., Pwr. & Lt., com.—no par.	65	....	....
Commonwealth Edison, com.	a136½	135¼	145
Commonwealth Pwr., 6% pf.	86½	82	88½
Commonwealth Pwr., com—no par..	40¼	28¼	42¾
Conn. Lt. & Pwr., 8% pf.	116	....	....
Conn. Lt. & Pwr., 7% pf.	108	....	....
Cons. Gas of N. Y., pf.—50.	59½	....	....
Cons. Gas of N.Y., com.—no par...	110¼	87	110½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	k104	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e110½	108¼	111¼
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e113	109	113¼
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e125	124	126
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e 52	45	57½
Cons. Pwr. & Lt., 7% pf.	104	....	....
Consumers Pwr., 6% pf.	98	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% ptc. pf	101	....	....
Continental Gas & Elec., 7% pr. pf.	96½	....	....
Continental G.&E., com.—no par...	140	....	....
Croker Wheeler, com.	19	....	....
Croker Wheeler, pf.	53	....	....
DALLAS PWR. & LT., 7% pf.	105	....	....
Dayton Pwr. & Lt., 6% pf.	100	....	....
Detroit Edison, com.	137½	123½	141½
Dubilier Condenser & Radio, com.— no par.	5¼	4¼	11
Dubuque Elec., 6% pf.	94	93	98¼
Duquesne Lt., 7% pf.	115½	111½	116½
EAST, N. Y. UTIL. pf.	93	80	85
Eastern New York Util., com.	65	70	75
Eastern States Power	15	....	....
Eastern States Power, pf.	k 87	89	95
Eastern Tex. Elec., 7% pf.	103	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com..	d229½	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	108½	104½	110
E. Bd. & Share Sec., com.—no par..	70½	56½	86
El. Household Util.	m 15	13½	25
Elec. Investors, 6% pf.—no par.	92	....	....
Elec. Investors, com.—no par.	45	30½	74½
Elec. Investors, 10% pd. receipts..	22	17	51
Elec. Pwr. & Lt., ctfs, pf.	97	89½	97½
Elec. Pwr. & Lt., ctfs., 40% pd.	105½	....	....
Elec. Pwr. & Lt., ctfs. full pd.	k105	....	....
Elec. Pwr. & Lt., ctfs., com—no par.	20½	15½	34½
Elec. Ry. Securities, com.—no par..	k 5½	4½	10
Elec. Refrig.	68¼	62½	78½
Elec. Storage Battery, com.—no par.	84¼	71½	86½
Elmira Wtr., Lt. & R. R., 7% pf...	99	97½	99
Emerson Elec., pf.	m101½	100	104½
Empire Dist. Elec., 6% pf.	l 88	82	88
Empire Power, A	25¾	21	32
Engr. Pub. Serv., pf.—no par.	k 96	87	96
Engr. Pub. Serv., com.—no par.	k 24	24	29½
Eureka Vac. Cleaner, com.—no par...	53	43	56
FAIRBANKS MORSE, pf.	k108½	108½	115
Fairbanks Morse, com.—no par.	k 53	46	59½
Federal Lt. & Trac., com.	30½	28	39½
Federal Light & Traction, pf.	k 87½	86	89
Federal Utilities, pf.	70	....	....
Federal Utilities, com.	17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	106	....	....
GALVESTON-HOUSTON ELEC., 6% pf.	17	....	....
Galveston-Hstn. El., com.	17	....	....
Gen. Elec., special—10.	11¼	11	11¼
Gen. Elec., new	89¾	79	90¼
Gen. G.&E., (Del.) com. A no par.	45	34	59
Gen. G.&E., (Del.) com. B no par.	37¼	28	45½
Gen. G.&E., (Del.) A pf. $8 no par..	k106½	105½	110½
Gen. G.&E., (Del.) A pf. $7 no par..	k 97½	95	99½
Gen. G.&E., (Del.) pf. B.	95	92½	96
General Public Service, pf.	k104	90	106½
General Public Service, com.	m 12½	12½	16½
Ga. Lt., Pwr., & Rys., 6% pf.	94	82	96
Ga. Lt., Pwr. & Rys., com.	70	65	81
Ga. Ry. & Power, 8% pf.	113	....	....
Ga. Ry. & Power, 7% pf.	104	....	....
Ga. Ry. & Pwr., 4% pf.	k120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h100	....	....
IDAHO PWR., 7% pf.	102½	103	106
Ill. No. Utilities, 6% pf.	k 90	88	92
Ill. Pwr. & Lt., 7% pf.	99½	....	....
Ingersoll Rand	k 92	80½	104
Int. Combus. Engr., com.—no par	56¼	33½	64½
Int. Utilities, class A—no par.	k 31¾	31	39
Int. Utilities, class B—no par.	k 4¼	4½	9½
Interstate Pwr., pf., no par.	93	....	....
Interstate Pub. Serv., 7% pf.	97	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	96	....	....
Jersey Central Pwr. & Lt., ptc. pf.	108	94	113
Jersey Central Pwr. & Lt., com.— no par	k 45	45	50
Johns-Manville, com.—no par.	145	....	....

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, July 31. lBid, low, high, Wednesday, Aug. 4. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 3	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	k110	107¼	112½
Kansas Gas & Elec., 7% pf.	103	99	103
Kentucky Hydro-Elec., pf.	a 96½	91¼	99¼
Kentucky Sec.,6% pf.	80	....	....
Kentucky Sec., com.	99	....	....
Kentucky Utilities, 6% pf.	93	90	95
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	k164	146	175½
Lehigh Pwr. Sec., com.—no par.	k 18	10	22
Long Island Ltg., 7% pf.	108	....	....
Long Island Ltg., com.—no par.	115	120	150
Los Angeles Gas & Elec., 6% pf.	96½	....	....
Louisville Gas & Elec., Class. A	24½	22¼	26¼
MANHATTAN ELEC. SUPPLY.	84½	56	87½
Manila Elec., com.—no par	k 33½	27½	39½
Maytag Mfg., com.	23½	19	24½
Memphis Pwr. & Lt., pf., $7, no par	106	103	107
Metro. Edison, pf.—$6—no par	93	....	....
Metropolitan Edison, pf., $7, no par.	103	....	....
Metropolitan Edison, com., no par.	45	45	50
Middle West Utilities, 7% pf.	a107½	97	111½
Middle West Utilities, 7% pr. lien pf.	a116	106½	123½
Middle West Utilities, com.—no par.	a115	108	134½
Midland Utilities, pr. ln. pf.	a102	98	104
Midland Utilities pf. A	a 99	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	101	....	....
Milwaukee Elec. Ry. & Lt., 6% pf.	93	....	....
Minn. Pwr. & Lt., 7% pf.	k103	102	105½
Miss. Pwr. & Lt., pf.	105	....	....
Miss. River Pwr., 6% pf.	96	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	101	....	....
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	98	....	....
Mohawk Hudson Pwr., com.—no par	26½	20½	28½
Montana Pwr., pf.	m117	112½	119½
Montana Pwr., com.	80½	69½	83½
Montreal Pwr., com.	f220½	....	....
Mountain States Pwr. pf.	97	....	....
Mountain States Pwr., com.	20	....	....
NASSAU & SUFFLOK, LTG., pf.	98	....	....
National Carbon, pf.	m126	125	128
National Elec. Pwr., pf.	a 96½	92	96½
National Electric Pwr-A.	a 24½	19½	26½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	101	96	102½
National Pwr. & Lt., com.—no par.	23	16½	38½
National Pub. Serv., 7% pf.	96	....	....
National Pub. Serv., pfc. pf.	k108	96	112
National Pub. Serv., A com.—no par.	20½	15½	24
National Pub. Serv., B com.—no par.	16½	10	17½
Nebraska Pwr., 7% pf.	106½	....	....
Nevada-Calif., Elec., com.	23½	18½	42
New Brunswick Pwr., pf.	50	30	55
New England Pub. Serv., pr. ln. pf.	97	98	99½
New England Pub. Serv., pf.	89	95½	97
N. J. Pwr. & Lt., 7% pf.	104	104	110
New Orleans Pub. Serv., 7% pf.	101½	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	87	....	....
N. Y. Central Elec., 7% pf.	97	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25.	k 28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	109	110	111½
No. Amer., 6% pf.—50.	k 51	49	51½
No. Amer., com.—10.	56½	42	67
No. Amer. Edison pf.—no par.	95½	91½	96½
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	92½	....	....
Northeastern Pwr., com.	19½	17½	36½
No. Indiana Gas & Elec., pf. A.	101	98	103
No. N. Y. Utilities, 7% pf.	103	....	....
No. Ohio Pwr.,	14½	11	26½
No. Ohio Trac. & Lt., 6% pf.	80	78	81
No. Ohio Trac. & Lt., 7% pf.	94	88	96
No. Ont. Lt. & Pwr., pf.	83	....	....
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	101½	99½	102½
No. States Pwr. com.	107½	97	136½
No. Texas Elec., 6% pf.	48	....	....
No Texas Elec., com.	18	....	....
OHIO BRASS, com. B—no par.	74	70	79
Ohio Brass, pf.	101	98	101
Ohio Gas & Elec., 7% pf.	94	92	95
Ohio Pwr., 6% pf.	95	93	96
Ohio Pub. Serv., 6% pf.	l 94	90	96
Ohio Pub. Serv., 7% pf.	l 99	96	100
Ohio River Edison, pf.	100	....	....
Oklahoma Gas & Elec., pf.	97	....	....
PACIFIC GAS & ELEC., 6% pf.	100	....	....
Pacific Gas & Elec. com.	129½	118	132½
Pacific Pwr. & Lt., 7% pf.	102	....	....
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	c 72	71	91
Penn-Ohio Edison, 7% pf.	96	....	....
Penn-Ohio Elec., 7% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	95½	94	97
Penn-Ohio Pwr. & Lt., 8% pf.	106	100	109
Penn Pwr. & Lt.—$7—no par.	106½	....	....
Penn Pub. Serv., 7% pf.	101	98	101
Penn Pub. Serv., 6% pf.	85	85	90
Penn Wtr. & Pwr., com.	c 153	141	171
Phila. Co., 6% pf.—50.	k 50½	47½	51½
Phila. Co., com.—50.	73½	59½	76½
Phila. Elec., com.—25	c 49	41½	67½
Pittsburgh Utilities, pf.—10.	k 17	14½	20½
Portland Elec. Pwr., 7% pf.	98	....	....
Portland Elec. Pwr., 6% pf.	83	....	....
Portland Elec. Pwr., 6% 2nd pf.	72	....	....
Portland Elec. Pwr., com.	30	....	....
Potomac Elec. Pwr., pf.	f108½	....	....
Pwr. Corp. of N.Y., com—no par.	m 79	77½	90½
Pwr. Sec., pf.—no par.	k 18	....	....
Pwr. Sec., com.—no par.	k 5	4	13
Pub. Serv. of N. J., 7% pf.	k108	103½	109½
Pub. Serv. of N. J., 8% pf.	k121	115	122
Pub. Serv. of N. J., com.—no par.	93½	72	93½
Pub. Serv. of No. Ill., 6% pf.	a105½	100½	106
Public Serv. of No. Ill., 7% pf.	m108½	112	116½
Pub. Serv. of No. Ill., com.—no par	a135	128½	140
Pub. Serv. of No. Ill., com.	a134	129½	140
Pub. Serv. of Okla., 7% pf.	95	95	100
Pub. Serv. Elec. & Gas, 6% pf.	k102½	97	104
Public Service Elec. Pwr., pf.	112	106	112½
Puget Sound Pwr. & Lt., 7% pf.	102	....	....
Puget Sound Pwr. & Lt., 6% pf.	83	....	....
Puget Sound Pwr., & Lt., com.	28½	28	66½
RADIO CORP. OF AM., pf.—50.	48	44½	48½
Radio Corp. of Amer., com.—no par.	46½	32	48½
Republic Ry. & Lt., pf.	106½	....	....
Republic Ry. & Lt., com.	82	....	....
Rochester Gas & Elec., 5% pf.	102½	101	104
Rochester Gas & Elec., 6% pf.	102	....	....
Rochester Gas & Elec., 7% pf.	105	103	107
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	50½	42½	54½
St. Joseph Ry., Lt., Ht. & Pwr., pf.	68	65	70
Servel Corp.	22½	21½	22½
Sierra Pacific Elec., com.	27	....	....
Sioux City Gas & Elec., 7% pf.	98½	....	....
S. E. Pwr. & Lt., pf.—$7—no par.	99½	....	....
Southeastern Pwr. & Lt., ptc. pf.	66½	....	....
S. E. Pwr. & Lt., com.—no par.	28½	20	46½
So. Calif. Edison, 8% pf.—25.	32	....	....
So. Calif. Edison, 7% pf.—25.	k 28	27½	28½
So. Calif. Edison, 6% pf.—25.	k 25	24½	25
So. Calif. Edison, com.	31½	30½	33
Southern Cities Utilities, 7% pf.	87	....	....
Southern Cities Utilities, com.	36	....	....
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B.	60	....	....
Southwestern Lt. & Pwr., $6 pf.	82	....	....
Southwestern Pwr. & Lt., 7% pf.	k104	100	105
Springfield (Mo.) Ry & Lt., 7% pf.	98	97	100
Standard Gas & Elec., 8% pf.	56½	53½	57½
Standard Gas & Elec., 7% pf.	102½	....	....
Standard Gas & Elec., com.—no par.	56½	51	69
Standard Pwr. & Lt., 7% pf.	k 94	90	97
Staten Island Edison, pf.—$6—no par	95½	....	....
Superheater, com.—no par.	16½	....	....
Syracuse Lighting, 7% pf.	107	105	109
Syracuse Lighting, 8% pf.	115	113	119
Syracuse Lighting, com.	335	300	340
TAMPA ELEC., com.	k 50½	48	67
Tenn. Elec. Pwr., 6% pf.	88	....	....
Tenn. Elec. Pwr., 7% pf.	101½	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	106	....	....
Tide Water Pwr., 8% pf.	102	....	....
Timken Roller Bearing, com—no par	62½	44½	62½
Toledo Edison, 7% pf.	l102½	101	103
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	86	90
UNITED GAS & ELEC., 6% pf.	95½	....	....
United Gas & Elec., com.—no par.	m 57	56	66
United Gas & Elec. (N.J.), 5% pf.	70	....	....
United Gas Impr.—50.	c109½	84½	144½
United Lt. & Pwr., pf.—$4—no par.	50½	....	....
United L. & P. pf.—$6.50—no par.	86	....	....
United Lt. & Pwr., com., A—no par	17½	12½	28
United Lt. & Pwr., com., B—no par	k 15	13	20
Utah Pwr. & Lt., 7% pf.	102½	....	....
Utica Gas & Elec., 7% pf.	104½	....	....
Utica Gas & Elec., com.	205	....	....
Utilities Pwr., & Lt., 7% pf.	93	....	....
Utilities Pwr. & Lt., com A	31½	28½	37
Utilities Pwr. & Lt., com. B—no par.	15½	14	18½
VERMONT HYDRO - ELEC., 7% pf.	94½	93	96
Virginia Elec. & Pwr., 7% pf.	104	102	106
Virginia Pwr., 7% pf.	70	....	....
Virginian Pwr., com.	73	65	76
WAGNER ELEC., pf.	b 67	61½	85
Wagner Elec., com.—no par.	b 20	13½	34½
Washington Ry. & Elec., com.	j180	....	....
Washington Ry. & Elec., pf.	90½	....	....
Washington Wtr. Pwr., com.	j134	132	137
West Mo. Pwr., 7% pf.	93	....	....
West Penn., 7% pf., temp. ctfs.	m100	95½	101
West Penn, com.	m125	118	130
West Penn Elec., pf.	k100	95½	100½
West Penn Elec., Class A.	k 93½	88½	97
West Penn Pwr., pf.	k109½	108	112
West Va. Lt., Ht. & Pwr., 7% pf.	94½	94	96
West Va. Utilities, 7% pf.—50.	45	42	50
Western Pwr., 7% pf.	94	....	....
Western States Gas & Elec., 7% pf.	93½	....	....
Western States Gas & Elec., com.	16	....	....
Westinghouse El. & Mfg., com—50.	70	65	79½
Weston Elec. Instrument, Class. A.	k 31	27½	32½
Weston Elec. Instrument, com.	18½	13½	19½
Wheeling Elec., pf.	96	86	98
Wis. Pwr., Lt. & Ht., 7% pf.	m 90	85	90
Worthington Pump, pf. A.	k 66	67½	80
Worthington Pump, pf. B.	k 58½	53	65
Worthington Pump, com.	28½	20½	44½
YADKIN RIVER PWR., 7% pf.	k105½	102	107½
Yale & Towne, com.—25.	67½	60½	69

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high, Saturday, July 31. *l*Bid, low, high, Wednesday, Aug. 4. *m*Latest quotations available.

$1.38 a share, on stock, comparing with $439,938, or $1.75 a share, in the preceding quarter and $170,802, or 68 cents a share, in the second quarter of the previous year.

Providence Merger Plan Is Made Public

Interests identified with Bodell & Company of Providence, Harris, Forbes & Company of Boston and the First National Bank of Boston announced a plan late last week under which the Narragansett Electric Lighting Company and the United Electric Railways Company of Providence may be consolidated if the necessary approvals of stockholders and the public authorities are obtained. It is proposed that the Narragansett company be acquired by the recently created United Electric Power Company, all the stock of which will be owned by the Rhode Island Public Service Company, a new corporation, and the last-named will also hold such stock of the Railways company as is exchanged under the plan. A price of $86 per share (par $50) with adjustment for dividends is offered for each share of Narragansett stock. Under this plan the United Electric Power Company will issue $27,500,000 in first mortgage 30-year bonds and 500,000 shares of preferred stock and 1,000,000 shares of class B stock of the Service company.

The class B shares of the Service company will be sold for $6,000,000 in cash. The coupon rate on the above bonds will be either 4½ or 5 per cent as the Service company may determine. Such bonds and stock will be all that will be now issued and outstanding except such class A stock as is issued in exchange for United Electric Railways Company stock or general and refunding bonds under the plan. Additional preferred stock (500,000 shares) may not be issued at less than $25 per share without the assent of a majority of preferred stockholders. The holders of the preferred stock of the Service company will be entitled to cumulative preferred dividends at the rate of $2 per share per year before any dividends are paid on any other class of stock and no more. Holders of class A stock will receive dividends to the extent of $4 per share per year senior to class B dividends, and after there shall have been paid on the class B stock of the Service company dividends to the extent of 75 cents per share in any year, the holders of class A stock will be entitled to additional non-cumulative dividends to the extent of $2 per share before any further dividends are paid on the class B stock in that year. The plan provides for the exchange of stock on the basis of one share of class A stock of the Service company for each share of stock in the United Electric Railways Company.

In an announcement by the Rhode

Island Public Service Company of which L. C. Gerry, Providence, is president, it is pointed out that the plan strengthens to a considerable degree the position of the bonds of the United Electric Railways Company. The market of the bonds will be benefited by the association of the lighting and power property and the railway. On Friday of last week President E. A. Barrows of the Narragansett company stated that after the proposed plan has been carefully analyzed the company will make a statement to its stockholders in ample time to enable these to reach a decision relative to the depositing of stock before Sept. 15, 1926, the final date for such action, with the Rhode Island Hospital Trust Company. Mr. Barrows said that the plan had been before the management of the Narragansett Electric Lighting Company but a few hours at the time of issuing the above statement.

Central Stations Raise $109,076,040 in July

During the month of July the central stations of the country raised $109,076,040 by the flotation of new issues of stock, bonds and notes. This figure compares with $164,925,000 for the month of June and with $69,488,510, the total recorded for July, 1925. None of these totals includes local sales to customers and employees. The largest individual offering was made by the West Penn Power Company in the form of first mortgage gold bonds, amounting to $18,500,000. It is interesting to note that considerable short-term financing was done in July and attention is called to the prominence of refunding operations. The rate of return yielded the investor, which receded to the 5.39 per cent mark in June from the 5.95 per cent mark in May, made a slight recovery during July to 5.54 per cent.

Company Reports

Name of Company	Gross Earnings for June 1926	1925
Alabama Power	$1,039,529	$928,069
Baton Rouge Electric	77,224	62,110
Binghamton Light, Ht. & Pwr.	151,751	124,328
Blackstone Valley Gas & Elec.	415,518	374,150
Brazilian Trac., Lt. & Pwr.	3,487,237	2,386,113
Broad River Power	167,939	115,092
Cape Breton Electric	43,995	37,163
Carolina Power & Light	629,649	523,335
Cities Service	2,245,979	1,858,430
El Paso Electric (Del.)	224,989	204,336
Edison Elec. Illg., Brockton	120,815	121,467
Electric Light & Power of Abington & Rockland	39,320	41,558
Florida Public Service	127,610	74,925
Fort Worth Power & Light	242,265	230,242
Galveston-Houston Elec.	377,468	320,658
General Gas & Electric	1,873,650	1,567,022
Lowell Electric Light	120,588	111,494
Metropolitan Edison	747,129	657,770
Nebraska Power	340,500	320,033
New Jersey Power & Light	193,363	96,772
North Carolina Public Service	157,168	148,402
Northern Penn. Power	56,784	49,891
Northern Texas Electric	204,676	194,005
Pacific Power & Light	311,833	294,432
Philadelphia Company	4,800,431	5,059,541
Public Service Corp	8,376,421	7,318,523
Puget Sound Power & Light	1,037,304	991,176
Republic Railway & Light	989,152	870,155
Savannah Elec. & Power	177,153	153,878
Sierra Pacific Electric	104,690	95,228
Southwestern Power & Light	1,226,274	1,148,912
Texas Power & Light	555,752	503,433
Washington Water Power	499,771	455,360

Security Issues of Electric Service Companies in July

Name of Company	Amount of Issue	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Public Service Co. of Colorado	$6,000,000	20	Gold debentures	To retire debentures, for acquisition of additional properties, to reimburse for properties already acquired, for additions and betterments and for other corporate purposes	6	99	6.08
Northern Indiana Public Service Co.	2,500,000	..	Cumulative preferred stock		6	92½	6.50
People's Light & Power Corp.	3,500,000	15	First lien gold bonds	To retire present outstanding funded indebtedness of constituent properties	5½	94¾	6.05
	800,000	..	Common and preferred stock	To reimburse treasury in part for expenditures made, for additions and improvements or for other corporate purposes	..	...	....
	1,650,000	1–2	Serial gold notes		5½	99.11 to 100	6.00 to 5.50
Pennsylvania Power Co.	3,800,000	30	First mortgage gold bonds	To pay for constituent properties, to cancel indebtedness of company and to reimburse for construction expenditures	5	98	5.13
Southern Cities Utilities Co.	5,500,000	25	First lien gold bonds, series A	To redeem outstanding bonds, to reimburse the company for expenditures made for additions and improvements, for construction and for other corporate purposes	6	100	6
	1,500,000	10	Convertible gold debentures, series A		6	98	6.25
Florida Power & Light Co.	12,000,000	28	First mortgage gold bonds	To reimburse for extensive additions to property, acquisition of additional properties and for other corporate purposes	5	95	5.35
General Power & Light Co.	1,500,000	1	Secured gold notes	To retire maturing of obligations and for the acquisition of additional securities	6	100	6
Georgia-Carolina Electric Co.	1,500,000	3	First mortgage gold notes		6	100	6
Northern Pennsylvania Power Co.	1,950,000	30	First and refunding mortgage gold bonds, series A	To retire bonds of companies recently acquired and for other corporate purposes	5	97	5.20
Virginia Public Service Co.	1,600,000	..	Cumulative preferred stock	To finance the merger and acquisition of properties, to retire securities of companies merging and for additions and betterments	7	97	7.25
Central West Public Service Co.	1,550,000	1	Gold notes	To finance acquisition of new properties and to provide additional working capital	5½	100	5.50
Iowa Southern Utilities Co.	1,100,000	24	Additional first and refunding mortgage gold bonds	To reimburse for addtiions to properties, for improvements and for other corporate purposes	5½	97½	5.7
Middle West Utilities Co.	7,000,000	..	Additional cumulative preferred stock	Acquisition of new properties and for other general corporate purposes	7	107	6.50
Rockland Light & Power Co.	.....	..	Convertible cumulative preferred stock	To provide funds to pay for additions and plant extensions	6	55	....
Wisconsin Valley Electric Corp.	800,000	16	Additional first mortgage bonds	To reimburse for expenditures made for additions, extensions and improvements	5	100	5
West Penn Power Co.	18,500,000	30	First mortgage gold bonds	To retire securities to reimburse for expenditures on purchase of station, for additions and extensions and for other corporate purposes	5	100½	5
North Carolina Public Service Co.	3,125,000	30	First and refunding mortgage gold bonds		5	94½	5.37
Wisconsin Public Service Corp.	1,850,000	..	Cumulative preferred stock	To reimburse for additions and extensions to the properties and for other corporate purposes	6½	100	6.50
Connecticut Light & Power Co.	8,000,000	30	First and refunding mortgage gold bonds, series C	Construction	4½	95¼	4.80
General Public Utilities Co	1,751,040	..	Cumulative preferred stock	Acquisition of properties and for capital expenditures	7	96	7.29
Central Power & Light Co.	14,500,000	30	First mortgage gold bonds	To redeem bonds, to reimburse treasury for expenditures for additions and for other corporate purposes	5	96	5.25
Virginia Public Service Co.	1,600,000	..	Cumulatice preferred stock		7	...	....
Derby Gas & Electric Co.	5,500,000	20	First lien gold bonds	Acquisition of stock, retirement of securities and for other corporate purposes	5	95	5.40
Total	$109,076,040						

Manufacturing and Markets

Facts on Net-Price Billing

Simplicity and Economy Are Chief Advantages—List Price and Discount Method an Economic Handicap—Most Jobbers Prefer Net Prices

By John L. Owen
General Manager E. B. Latham & Company, New York

BILLING electrical supplies at list prices with stated discounts therefrom is a practice that is said to have been inaugurated by one or more manufacturers about 1898. It has grown until it is perhaps the prevailing system today in selling a number of different kinds of electrical supplies. Before 1898 it was the practice to sell on a net basis. Net price billing is said to possess many advantages, the chief of these probably being simplicity and economy.

An Economic Handicap

There are many and wide differences in the cost of doing business, depending, among other things, on a variety of circumstances, including the location of the merchant, his plant and equipment, wages, advertising, taxes and other items too numerous to mention. Any economical and efficient method in the electrical supply jobbing business tending to reduce the cost of doing business and to eliminate unnecessary operations would be of decided benefit to consumers as well as to merchants. Education has done much to bring about reduction of costs, through proper knowledge of accounting principles and rigid economy of operation, but there are some expensive features of every business which are owing, in whole or in part, to the practices of one or more other branches of the industry or to other outside circumstances over which the merchant himself has no control.

It would seem that the practice followed by some of the electrical supply manufacturers, of billing goods at list prices and discounts, may be one of these. It is said by many of those experienced in the industry, whether as manufacturers or jobbers or dealers, to be an economic handicap. In a canvass made among the electrical jobbers 83 per cent indicated a preference for net prices instead of the old list and discount.

In this age of multifarious and complicated commercial practices we find some elaborate systems that make for increased costs of doing business and yet that seem susceptible of simplification and consequent economy, not only to the jobber, but also to the manufacturer and to the dealer.

The jobber buys his merchandise from many manufacturers. His incoming and outgoing bills cover thousands of items. When merchandise is billed to him at list and discount, it is necessary to check and compare every list price and every discount on the bill with each of the respective manufacturer's announced lists or catalogs. The manufacturer himself has, of course, necessarily done this, and so there is here an expensive duplication of work and a consequent increase of the cost of doing business. Inevitably there will be errors in computation, which entail still further clerical work and a great amount of correspondence with the manufacturer and the dealer. The jobber handling goods billed to him at list with discount usually finds himself under the necessity of pursuing the same practice when he in turn sells to his customer, and so there is still further economic waste through the cost of bookkeeping and clerical work that is thus put upon the dealer.

Also Affects Inventory

At inventory time the wasteful expense flowing from the practice of billing list and discount becomes more burdensome than ever. In order to arrive at any figure which approximates a correct inventory, the long, tedious and expensive procedure of checking list prices and discounts goes on. Again errors creep in and weeks of time and effort are devoted to the work. When the jobber or dealer prepares a catalog, he is again faced with added expense, owing to this practice. The constant changes in prices by manufacturers necessitate changes in jobbers' catalogs and also corrections and alterations in the data used by salesmen. These continuous alterations of catalogs and the attendant expense and labor again enter into cost of the product and entail great waste, which could be greatly reduced under the more efficient system of net price billing.

Banks, schools of business and our universities, government departments, economists and many large private concerns, at the expenditure of great sums of money and effort, are constantly engaged in the study of the problems of commercial practice with a view to economy and the simplification of methods and the consequent reduction of costs and of prices to the public. From the standpoint of the manufacturer, it is sometimes argued that it is impracticable to popularize an article by advertising and by intensive sales campaigns unless the manufacturer himself fixes a uniform list price. On the other hand, it is pointed out that many manufacturers do successfully advertise and constantly increase their good will with the consumer and the volume of their sales without attempting to fix a list price to the consumer or to the retailer. The manufacturers of appliances do not as a rule favor the elimination of list prices for that reason—that is, owing to their value as a means of informing the public the price at which an article is sold at retail. From the standpoint of the government, through the Federal Trade Commission, the Department of Justice or other agencies, it has been said that the practice of billing list and discount promotes alleged illegal price fixing.

List Prices Work Two Ways

Contrasting with that argument is the statement sometimes made by merchants in various industries, that the manufacturer's practice of fixing a list price and selling his goods list and discount promotes price cutting by furnishing to the price cutter an object of advertised or known resale price at which he may direct his cut-rate advertising, window displays and other sales effort for the purpose of drawing consumers into his store, where presumably the average of all of his prices is such as to show him a net profit, notwithstanding his possible loss on certain leaders so specially advertised. The discussion regarding these two points of view apparently leads nowhere. Perhaps the fact is that the manufacturer's practice of selling at list and discount promotes both resale price maintenance and price cutting, depending upon the sales policies of the various kinds of merchants who handle his products and the variety of conditions under which they are marketed. Obviously every manufacturer must determine for himself, and independently of his competitors and of his customers, not only the prices at which he will sell, but also the methods of selling that he will employ.

Simplification a Big Factor

It is argued that if the manufacturer fixes no list, then there is no price to be maintained and no price to be cut. Whatever may be said either by the manufacturer or his wholesale and retail customers upon the subject of economy, it is said to be unquestionably true that the elimination of the practice of selling list and discount would make for simplification.

There are many advantages to the jobber in having his costs of material figured in terms of net prices not only in buying but in selling. When a salesman is approached by his customer and asked the price of any given article, it saves a great deal of time if he has a net price to offer rather than having to figure out a price from the list and deduct the discount before he can quote. The argument from the point of view of the jobber is that it is a question of economy and simplifies the work of his office force. This would apply to the quotation, billing, costing and sales departments. There would be not only a saving of time and labor, but a safe-

guard against mistakes in figuring and extending bills, etc. Both manufacturer and jobber have lost considerable money over a period of years in wrong extensions in quotations and bills. Net costs and selling prices would help to minimize this trouble and also eliminate variation in prices quoted. Quotation clerks and salesmen are more likely to follow the proper steps in given quantities with net prices to work with.

PRODUCTS ON A NET-PRICE BASIS

A great many electrical manufacturers have been on a net-price basis for some time past. Such lines as conduit, wire, outlet boxes and many others might be mentioned. There are still many manufacturers clinging to the old idea of a list price and discount, but gradually they are coming around to the new idea, feeling that they, too, would economize by so doing. Under the old system a manufacturer who wanted to change a list price of a given article had to take that item out of his regular schedule and establish another schedule to overcome any difference in discount. Net prices would enable him to meet market conditions without necessitating a complicated system of schedules, some of which are still in existence. It is to be hoped that in the interest of economy and simplification the idea of net prices will be brought to a point where the entire electrical industry will operate on that basis.

The United States Department of Commerce, particularly during the administration of Secretary Hoover, has been most active and successful in bringing about simplification of business practice, with attendant economy, in various industries. The United States Chamber of Commerce and various other trade organizations have given much time and thought to the study of business methods and business costs, for the purpose of promoting economy and efficiency.

GOVERNMENT MAY HELP

The government could perform a most useful service to all branches of the trade in conferring with manufacturers and merchants upon this subject and considering with them the advantages and disadvantages of net-price billing, and then recommending, following conferences in each industry with those who may be interested, such reform as the experts of the Department of Commerce and their trade advisers in the different industries should consider to be the most efficient and economical from the standpoint of manufacturers as well as jobbers, dealers and consumers.

Sign Manufacturers Initiate Co-operative Market Program

The organization of sign manufacturers for the establishment of business practices which will aid in developing the market profitably is desired by every one in the industry, according to a report of the advisory committee, appointed by W. W. Freeman, president of the Society for Electrical Development, to sponsor and direct the electrical advertising co-operative market development program, in a meeting held July 29 at the headquarters of the society. The committee was also in full accord that the program be initiated without further delay by underwriting the minimum organization expenses, preparatory to inviting the united support and membership of companies and individuals engaged in or interested in the sale of commercial electric signs, spectacular electric displays, illuminated poster panels or painted bulletins, traffic signals, directional signs, etc.

It was decided to postpone distribution of the plan book of organization, which was submitted and approved, pending the reports of sub-committees covering a survey of the potential market, a local sales plan, and a recommended basis of membership. In the meantime the underwriting fund of $15,000, pledged at the meeting, insures getting the program under way immediately.

The personnel of the advisory committee includes O. D. Ziegler, Reynolds Electric Company, Chicago, chairman, and the following groups:

Commericial Group.—James M. Gilchrist, Federal Electric Company, Chicago; P. D. Howso, Electrical Products Corporation, Los Angeles; H. G. Russell, Opalume Sign System, Battle Creek, Mich.; R. R. Wiley, Flexlume Sign Corporation, Buffalo.

Outdoor and Display Group.—Herbert Fisk, General Outdoor Advertising Company, New York; George W. Kleiser, Foster & Kleiser, San Francisco; Harry C. Macdonald, Walker & Company, Detroit.

Indoor Group.—L. L. Strauss, Viking Products Corporation, New York.

Accessory Group.—E. C. White, Tork Company, New York.

Lamp Group.— E. M. Beach, Westinghouse Lamp Works, New York; H. H. Magdsick, National Lamp Works, Cleveland; E. E. Potter, Edison Lamp Works, Harrison, N. J.

Central-Station Group.—W. T. Blackwell, Public Service Electric & Gas Company, Newark, N. J.; Julius Daniels, Edison Electric Illuminating Co. of Boston; H. W. Derry, Union Gas & Electric Company, Cincinnati; Oliver Hogue, Commonwealth Edison Company, Chicago.

Delinquent Electrical Accounts

(Data Supplied by National Electrical Credit Association)

NUMBER OF ACCOUNTS REPORTED

Division	June 1925	June 1926	Per Cent Increase or Decrease	Six Months 1925	Six Months 1926	Per Cent Increase or Decrease
New York	415	422	+1.7	2,411	2,390	— .8
Middle and Southern Atlantic States	259	125	—51.7	1,423	1,163	—18.3
New England	87	83	— 4.6	512	541	+ 5.6
Pacific Coast	17	21	+23.5	115	167	+45.2
Central	900	877	— 2.6	5,531	5,638	+ 1.9
Total	1,678	1,528	— 8.9	9,992	9,899	— .9

TOTAL AMOUNTS REPORTED

Division	June 1925	June 1926	Per Cent Increase or Decrease	Six Months 1925	Six Months 1926	Per Cent Increase or Decrease
New York	$53,414	$71,745	+34.3	$366,011	$356,730	— 2.5
Middle and Southern Atlantic States	36,497	12,720	—65.1	201,149	124,121	—38.3
New England	15,310	8,751	—42.8	60,454	51,815	—14.3
Pacific Coast	2,193	2,538	+15.7	16,746	29,331	+75.1
Central	102,366	96,837	— 5.4	664,887	606,558	— 8.8
Total	$209,780	$292,591	— 8.1	$1,309,247	$1,163,555	—10.7

AVERAGE AMOUNTS

Division	June 1925	June 1926	Six Months 1925	Six Months 1926
New York	$129	$170	$151	$149
Middle and Southern Atlantic States	140	100	141	107
New England	175	105	118	96
Pacific Coast	129	121	145	175
Central	114	110	121	108

Business Conditions

MANUFACTURERS report sales during July in good volume. Several motor companies state that general industrial plant buying as well as contractor business is good. Virtually the entire country is transacting a steady business—better than is usual during this period. A decrease in sales, anticipated in some quarters, has not materialized. A contract for about $800,000 has recently been awarded for transformer and switching equipment for Muscle Shoals, an order was placed by a central-station company in New England for a 60,000-kw. turbo-generator set, and another order by a central-station company in the New York district for $250,000 worth of rotary converters.

Evidence is again forthcoming of the activity of electric refrigerator manufacturers in the large expansion program announced by the Electric Refrigeration Corporation. That company plans the immediate expenditure of $6,500,000 on new buildings and additions to plant. Sales of fractional-horsepower motors to refrigerator and electric appliance manufacturers are also strong. The report of the Washing machine companies also show a surprising strength in sales for the second quarter of the year. With practically no exceptions in the history of that industry, sales during June have always shown a seasonal decline prior to this year.

In New England several negotiations for turbo-generators have been brought to a culmination in the last few days, and negotiations for this type of equipment continue to show an encouraging trend, with a number of orders anticipated in the fall. Small-motor sales

show a falling off in volume, but the demand for fractional sizes is strong, particularly from machine tool and electric appliance manufacturers. A very satisfactory volume of sales of transmission and distribution line materials is reported in the New York district. Several orders were placed for substation apparatus, one of which called for rotary converters and amounted to $250,000. In the Southeast transformers and line construction materials are in active demand, and one jobber reported the receipt of an order for $15,000 worth of poles. "White-way" equipment continues to be in active demand, inquiries on high-tension oil switching equipment have been very satisfactory, and several good orders for textile-mill-motor equipment are in immediate prospect. The trend of buying is steady in the St. Louis district and has continued through midsummer, with only a few weak spots. The bumper wheat crop in Kansas has had its effect on sales to flour mills for the last two or three months. Large volume of sales is reported in the Middle West, industrial plants are operating steadily, and central-station companies are placing many orders. A large utility company has been buying material at a rate of more than $90,000 per day. On the Pacific Coast many equipment orders from industrial plants are pending, power-company purchasing of construction material was light and export sales, particularly to Mexico, showed a decline. The industry is optimistic in that territory owing to the outlook, which is considered very satisfactory.

Prices of Copper, Lead and Tin Advance Further

Prices of copper, lead, and tin have all registered substantial advances and are decidedly firm at the higher levels. The volume of copper sales dropped considerably but there was an active inquiry for lead and tin. Copper has continued on its march toward the 15-cent level, though the advance has been orderly and well justified by the unusually great demand. On Thursday and Friday last week selling was general at the 14⅜-cent level in the East and at 14¼ cents in the Middle West, and a little was obtainable at these levels on Saurday. On Monday of this week most sellers advanced their prices ⅛ cent, though a fair tonnage was sold at 14.425 cents, and on Tuesday at 14.475 cents for Eastern deliveries. On Wednesday every seller seems firm at 14½ cents in the East and 14⅝ cents in the West, though there is less interest on the part of consumers. Unprecedented bookings are reported by firms making copper products, such as sheets, wire, and tubes; the automobile demand has been excellent and newer outlets, such as washing and refrigerating machines, have required much more copper than was expected.

NEW YORK METAL MARKET PRICES

	July 28, 1926 Cents per Pound	Aug. 4, 1926 Cents per Pound
Copper, electrolytic	13.95–14.40	14.525
Lead, Am. S. & R. price	8.75	8.90
Antimony	15⅛	15⅛
Nickel, ingot	35	35
Zinc spots	7.825	7⅜
Tin, Straits	63.625	65⅜
Aluminum, 99 per cent.	27½	27½

Base copper price Aug. 4, 1926, 16 cents.

Another advance was made in the contract price of lead by the American Smelting & Refining Company on Friday last week, when 8.90 cents was established as the New York level. Other sellers lost no time in following the Smelting company's lead. Some few sales have been made at slight premiums, as high as 9.15 cents (New York basis) having been paid where special brands were desired. Inquiries have been heavy throughout the week for both August and September shipment. Consumption seems to be good in practically every line. A fairly good volume of zinc orders was booked, though galvanizers are in general buying only in small lots and for early delivery. Dealers and consumers were active purchasers of tin on Monday and Tuesday, the consuming demand being largely for prompt delivery.

Line Material Sales in Good Volume in New York District

A very satisfacory volume of sales of transmission and distribution line materials to public utility companies is reported in the New York district. No particularly large single orders are evident, the greater part of this material apparently being for maintenance or short line construction. The demand for generating equipment is very slow, the present trend being for the operating companies to increase the use of present facilities by interconnection, extension of transmission lines, etc. Several orders for substation apparatus are noted, one company having recently placed an order for rotary converters costing approximately $250,000. In the industrial field motors up to 10 hp. continue in active demand, particularly among manufacturers of machine tools. The general demand for larger-sized apparatus is not so good, although one order for a considerable number of transformers and motors for use in a cement mill is reported.

Turbo-Generator Sales Active in the New England District

Several negotiations for turbo-generators in the New England district were brought to a culmination in the last few days. A large central-station company has awarded a contract for a 60,000-kw. unit. A turbo-generator unit with accessories amounting to about $50,000 was also ordered by another company for installation in its Maine plant, and another order was recorded during the week for a 1,000-kw. unit for additional equipment for a southwestern public utility company. Negotiations for this type of equipment continue to show an encouraging trend and a number of orders are expected in the fall. Small motor sales show a falling off in volume, but the movement of the fractional sizes is strong and many orders in good numbers are noted. One manufacturer reported a number of orders ranging for lots from fifty to two hundred with the demand from machine tool and electric appliance manufacturers quite active. The demand for control and switch apparatus is spotty though scattered orders for the latter are being received.

Industrial heating activities for the coming fall are very encouraging. A prominent manufacturer reports a greater volume of inquiries at this time than was prevalent last year and an earger interest on the part of the machine trade to consider electric heating for their various operations. Street-lighting projects are being considered by cities in Massachusetts among which Haverhill and Leominster may be noted. Household appliance sales have declined as compared with the last few weeks but, in view of the season, are progressing with considerable activity. New construction demands appear promising with the volume of contracts reported still showing a strong tone.

Transformers and Line Materials Active in the Southeast

Activities in the high-tension transformer market have been quite satisfactory in the Southeast and more than an ordinary number of inquiries are reported for sizes from 1,000 kw. to 2,000 kw. Recent electrification contracts closed by industrial plants will stimulate the movement of sizes below 1,000 kw. within the next 30 to 60 days. Central-station companies continue to be good purchasers of line-construction materials and an order for $15,000 worth of poles was received by an Atlanta jobber. Distribution transformers and meters are also reported in good demand, with incandescent lamps selling well for this period of the year.

"White-way" equipment continues to be in active demand. A large manufacturer has installed a plant in Valdosta, Ga., for the manufacture of lighting standards. The new plant has a capacity of 26 standards per day but additional capacity is scheduled for the near future. Inquiries on high-tension oil-switching equipment have been very satisfactory with a reasonable volume of sales, many of them being for the remote control type. Several very satisfactory orders for textile-mill-motor equipment are in immediate prospect and the demand for small motors for industrial use is reported as reasonably satisfactory for this period of the year. Jobbers report the preliminary receipt of orders for appliances for the fall trade, and prospects are the total will reach quite a volume within the next 60 days. Electric ranges, owing to campaigns by the larger central-station companies, are selling in very good volume, and one power company reports a very successful flat-iron campaign, over 1,600 irons being sold in two weeks.

Many Equipment Orders Pending on the Pacific Coast

Power-company purchases on the Pacific Coast have included 350,000 ft. of guy strand, 300 poles, miscellaneous hardware in about five-hundred-dollar lots and sundry wiring supplies in similar quantities. Sales of this class of material to power companies have fallen off, and railroad purchasing is also quiet. Export business, particu-

larly to Mexico, has been good until the present disturbed condition in that country. Inquiries for electric appliances and ranges from that territory are good. An inquiry from a Honolulu sugar plant covers about $7,000 worth of material, principally rubber-covered wire and conduit. Dealers' and contractors' orders include 3 carloads of rigid iron conduit, 150 vacuum cleaners and 250,000 ft. of rubber-covered wire. Machinery orders include a 2,400-hp. motor and miscellaneous equipment for a steel mill, six motors with special gear equipment for boring oil wells at a cost of $17,500, two orders for substation transformers from Hawaii, each about $30,000, one order for $11,000 worth of 60,000-volt pin-type insulators for Nevada and another for the same material from the San Francisco Bay district amounting to $6,000. Several orders were also received for distribution transformers for irrigation loads.

Sales of schedule materials are reported in usual volume in the Puget Sound district, with few orders for heavier apparatus although several are pending. One contract was let for 500 hp. of motors for a mill near Olympia. A 3,000-kw. turbine and about 75 motors will shortly be purchased by a Walton mill, 20 motors for a pulp mill in Bellingham, $100,000 worth of motors for a water supply system, and equipment for the first unit of a large paper mill. A large building program, amounting to about $10,000,000 is planned for fall and winter installation in the Puget Sound district.

Trend of Buying Steady in the St. Louis District

Steady trend of buying has marked the electrical market in the St. Louis district and has continued through midsummer with only a few weak spots. The delayed arrival of the very hot weather has decreased the fan business by about 25 per cent, according to the manufacturers. There has been a steady demand for transformers, switching apparatus and motors. The bumper wheat crop in Kansas has had its effect on sales to flour mills for the last two or three months. A contract has lately been closed for an entire new street-lighting system for the city of Springfield, Mo., and another order has just been placed for all material required for rewiring one of the smaller cities in this district. Considering the business for the district generally, manufacturers say that this has been a splendid season for the electrical industry with no extraordinary sales but a steady demand that has kept sales at a small percentage above that of last year.

Large Volume of Sales Reported in the Middle West

Good business is reported from most sections of the Middle West. The larger volume of business transacted for this period is gratifying, according to manufacturers. Reports from agricultural districts are varying, but generally optimistic. Industrial plants are quietly operating at a point considered satisfactory, while utility companies are very busy with new construction work and extension of existing lines. Purchasing by central-station companies is steady, and in good volume, as indicated by the figures of one large company, which has been buying at a rate better than $90,000 per day. Among the interesting orders recently placed were one for 100,000 ft. of 1,500,000-circ.mil paper and lead covered cable and another for 12,000 ft. 1,000,000-circ.mil paper lead covered cable. There has been a good demand for pole line hardware, poles, and meters. Jobbers' sales are reported as substantially good.

Activities of the Trade

Westinghouse Lets Contract for Large Arc-Welded Building

A contract has been let by the Westinghouse Electric & Manufacturing Company to the American Bridge Company for the construction of a five-story building to be built at the Sharon, (Pa.) works of the company for the manufacture of transformers. The building will cost about $275,000 and will include about 700 tons of steel. Shop as well as field connections, including the assembly of plate girders, will be done by arc welding. It is said that this will be the largest completely welded building frame that has been constructed to date.

Two welded buildings are at present under construction at the East Pittsburgh works of the Westinghouse company. One is a three-story addition to the chemical laboratory, and the other is a high single-story building of mill type, about 40 ft. by 60 ft., equipped with a crane runway.

Electric Refrigeration Adopts Extensive Building Program

A 35-acre tract of land has been purchased by the Electric Refrigeration Corporation in the city of Detroit and the building of a large new factory will be begun at once. A. H. Goss, president of the corporation, announces that the company has found it necessary to greatly increase its production facilities to take care of the tremendous demand for all of its products. A reinforced concrete modern three-story building, 440 ft. by 600 ft., with approximately 600,000 sq.ft. of floor space will make up the first unit in the building program. An administration building, 200 ft. by 55 ft. and four stories high, will also be built at this time. The new administration building and factory are to be completed and ready for occupancy Feb. 1, 1927.

The new factory will be located on Plymouth Road at the junction of the Pere Marquette and Pennsylvania railroads. The manufacturing operations of the Kelvinator and Nizer divisions will be consolidated in this new plant with resulting economies for both. The investment in land buildings and equipment in Detroit will total $5,000,000, and, in addition, the board of directors has authorized the expenditure of $1,500,000 on the enlargement of the factory of the Leonard Refrigerator division at Grand Rapids, Mich. This will bring the annual production of that plant up to 500,000 ice cabinets.

When this new building and enlargement program is completed the corporation will have a yearly production capacity of 1,000,000 units, comprising household and commercial automatically operated electric refrigerating machines, both self contained and separate, ice cream cabinets, milk cooling electric refrigerators and ice cabinets. As a result of its expansion program the corporation will, it is expected, give employment in 1927 to over 10,000 people.

Purecold Products Corporation to Make Electric Refrigerators

A corporation, known as the Purecold Products of America, Inc., 21 East 40th Street, New York, has been organized to manufacture electric refrigerators which will be built and marketed on a mass production basis under the name Purecold. Thomas A Scott, formerly president of the Merritt, Chapman and Scott Corporation, is president of the company. G. T. Rogers, vice-president, and Matthews Brown, treasurer and secretary. A. W. Bowie and Charles B. Reed are among the directors. The corporation has a total authorized issue of 250,000 shares, out of which it expects to offer in the near future 75,000 shares. Of the total authorized issue 33,615 shares are to be held in reserve.

General Electric Company Gets Muscle Shoals Contract

A contract for twelve 21,666-kva. transformers, eight 400-amp. and eight 600-amp., 154,000-volt oil circuit breakers, lightning arresters, disconnecting switches, switchboard, steel work, and also covering complete installation of the equipment was awarded to the General Electric Company by the government. The equipment is for installation at Muscle Shoals and the award was made following the public opening of bids on July 20 in the office of the district engineer at Muscle Shoals. The company's bid amounted to $799,000 and called for completion of the work in 230 days.

The Graybar Electric Company announces the appointment of A. B. Vandercook as assistant manager and H. T. Simmons as sales manager of the Los Angeles (Cal.) distributing house of the company, effective as of July 1, 1926.

The Aircraft Electric Appliance Company, Toledo, Ohio, has awarded a general construction contract for an addition to its plant, which will cost $50,000, with machinery and equipment.

The National Carbon Company, 30 East 42d Street, New York, has plans under way for expansion in its electric battery and affiliated electric equipment plant at Fostoria, Ohio, to comprise a group of ten to twelve new buildings, varying from one to five-story high, totaling in all about 19 acres of addi-

tional floor space. The entire project will cost more than $3,500,000, with machinery. Stone & Webster, Inc., 47 Milk Street, Boston, Mass., is architect and engineer.

The Louis Allis Company, Milwaukee, Wis., announces the appointment of the following additional sales representatives: C. R. Reynolds, the C. R. Reynolds Company, 1308 Jackson Street, Toledo, Ohio; A. R. Zapp, Southern Engineering Company, 301 Lyric Building, Birmingham, Ala.; R. E. Lehde, Electron Engineering Company, Whitney Central Building, New Orleans, La.; D. H. Hull, 432 North Montgomery Street, Memphis, Tenn.

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., is placing on the market a thin type of canopy switch with an especially short body and narrow in width.

The Grinnell Washing Machine Company, Grinnell, Iowa, has been reorganized as the Grinnell Washing Machine Corporation and has started production. C. W. Wilcox of Chicago is president of the new corporation, I. N. Merritt of Detroit is secretary and treasurer, and R. R. Monroe of Des Moines, Iowa, is vice-president. W. S. Dodge, formerly factory manager for the Grinnell company, will be retained and will be actively engaged as one of the executives of the business, and George Lewis will continue in the capacity of production manager. The authorized capital stock of the company is $10,000 fully paid up. This corrects an item appearing in the July 24 issue of the ELECTRICAL WORLD.

The Trumbull Electric Manufacturing Company, Plainville, Conn., is placing on the market a four-circuit residence panel on a porcelain base as a supplement to its other line of residence panels from four to fourteen circuits on a composition base.

The Fibroc Insulation Company, Valparaiso, Ind., manufacturer of Fibroc-Bakelite, announces the appointment of Herbert S. Freeman as district representative in the northern New York territory, with headquarters in Rochester.

The Iroquois Electric Refrigeration Company, 1600 Arch Street, Philadelphia, announces that Wm. Taylor Poulterer, formerly treasurer and sales manager of the Electrical Development & Machine Company of Philadelphia, has been appointed Philadelphia sales manager. Mr. Poulterer will cover Pennsylvania, southern New Jersey, Delaware, Maryland and Virginia.

The Burke Electric Company, Erie, Pa., manufacturer of direct and alternating current machinery and arc-welding equipments, announces the appointments of Louis D. Moore, 1201 Syndicate Trust Building, St. Louis, and the W. C. Fletcher Company, 725 Continental Bank Building, Indianapolis, as district sales agents in their respective territories.

H. S. Arnold, formerly local manager of the New York office of M. J. Daley & Company, Inc., announces that he has severed his connection with that company and will continue in the field of electrical installations under the name of the H. S. Arnold Company, Inc., at 67 West 44th Street, New York. The new company intends to make a specialty of power house and substation work and the installation of electrical apparatus and wiring in industrial plants.

The Hisey-Wolf Machine Company, Cincinnati, Ohio, manufacturer of portable electric tools, is considering the erection of a three-story addition, 50 ft. x96 ft.

The General Electric Company has paid approximately $1,396,000 in supplementary compensation to 30,780 employees of its various plants and offices and who have been in the employ of the company for five years or more. This sum represents 5 per cent of the earnings of these employees for the six months ended June 30, 1926.

The Nizer division of the Electric Refrigeration Corporation, Detroit, has inaugurated a service correspondence school for the officials, salesmen and employees of every ice-cream manufacturer of United States and Canada.

The Westinghouse Electric & Manufacturing Company has received an order from the Niagara Electric Service Corporation for 16 truck-type equipments with its B-16 oil circuit breakers and automatic reclosing equipment. Four 15-kv., hand-operated, incoming line breakers are also included in the order. The apparatus will be used in four substations.

New Equipment Available

Refractory Material

A new refractory material in stucco form and which is used for the maintenance of brick or monolithic furnace walls and arches has been placed on the market by the Plibrico Jointless Firebrick Company, 1130 Clay Street, Chicago. It is applied to the wall or arch as often as the boiler comes off the line, replacing that part of the furnace wall that has been eaten away during the last service period. Plibrico stucco, which can only be used where very high furnace temperatures are obtained, is applied with a trowel in thin coats using several coats if necessary.

Three Element Meter

A line of three-element demand meters, known as the type RA, has been added by the Westinghouse Electric & Manufacturing Company to its series of three-element meters furnished in the standard OA house and switchboard types to make a complete line of three-element meters to meet the requirements of the central-station company. The new meters are similar to the standard RA and OA house and switchboard type meters differing from them only in that they possess an additional metering element and disk. It is said that all the desirable qualities of the two-element meters are retained in the new products.

Combination Welder and Air Compressor

A combination air compressor and arc welder driven by a gasoline engine and mounted on a single base has been placed on the market by Schramm, Inc., West Chester, Pa. The outfit consists of a Buda gasoline engine, a Schramm compressor and a General Electric welding outfit. The complete equipment may be mounted on a standard 2-ton truck or can be made portable by adding steel or rubber-tired wheels.

The engine is a 24-hp., 800-r.p.m. unit, which may be started and operated independently of either the compressor or welding generator. The compressor is a two-cylinder, water-cooled machine with a capacity of 120 cu.ft. per minute and equipped with an automatic unloading device. The air receiver is 16 in. in diameter by 42 in. high. The welding equipment consists of a belt-driven WD-12 arc welder with an idler pulley for belt tightening. By the use of a Borg & Beck 12-in. clutch coupling, either of the machines may be connected to the engine. The structural steel base is 8 ft. 4 in. long, 5 ft. 11 in. wide. The outfit is 3 ft. 10 in. high, and net weight is 4,000 lb.

Floodlight for Color Lighting.—The Pittsburgh floodlight, No. FLC-500, designed particularly for outdoor color lighting and for long distance projection has been placed on the market by the Pittsburgh Reflector Company, Bowman Building, Third Avenue and Ross Street, Pittsburgh. The floodlight has a concentrated beam, and is designed especially to accommodate the "Laco" color cap. The unit consists of a cast metal base, sheet metal housing for lamp and reflector, tinned and painted aluminum inside and outside, cast aluminum focussing mechanism, heat-resisting glass cover in hinged aluminum door, and silver-plated glass reflector.

Radio-Frequency Instruments. — A new line of radio-frequency instruments, thermal type, has been placed on the market by the Roller-Smith Company, 233 Broadway, New York. The type TW ammeters, 3½ in. in diameter, are supplied in both surface and flush cases and have back connections only. They are available in capacities ranging from 0-10 amp. The type FW ammeters and milli-ammeters are supplied in surface case only with back connections and are available in capacities ranging from 0-20 amp. A complete line of instruments to match these types are also available.

Lamp Marking and Testing Machine. —A machine for marking bayonet bases of miniature and automobile lamps and for simultaneously testing the bulb has been developed by the General Engineering & Supply Company, 160 Fifth Avenue, New York. It is a foot-operated machine and capable of a production of 10,000 lamps per day. It may be used for printing with ink or acid and is adapted for testing single or double contact lamps as well as double circuit lamps.

New Trade Literature

ELECTRIC FURNACES, WELDING RESISTORS, DRUM TYPE CONTROLLERS, ETC.—The General Electric Company has issued the following leaflets descriptive of various equipment: Bulletin GEA-37A, "Direct Heat Electric Furnaces"; GEA-46A, "Synchronous Motor and Condenser Panels"; GEA-440, "Type CL-1 Turn-Pull Control Switch"; GEA-152, "Auxiliary Welding Resistors"; GEA-80, "Automatic Reduced Voltage Starters for Synchronous Motors"; GEA-468, "CR 3105 Drum Type Controllers"; GEA-449, "Line Material and Rail Bonds for Mines"; GEA-434, "Varying Speed Induction Motors for Elevator Service"; GEA-467, RC 7022-A1, "Automatic Starters for Slip Ring Induction Motors," and GEA-166, "Alternating-Current Crane and Hoist Motors."

MAGNET CONTROLLER.—A pamphlet describing the Ohio (push the button) magnet controller has been issued by the Ohio Electric & Controller Company, Cleveland. Complete connection diagrams are included.

OIL AND GAS BURNERS.—"Rockwell Oil and Gas Burners for Industrial Heating Furnaces," is the title of bulletin No. 270 issued by the W. S. Rockwell Company, 50 Church Street, New York. The bulletin is a technical summary of the subject and outlines the function of oil burners in industrial heating operations.

RADIO-FREQUENCY METERS.—Bulletin No. 810, superseding that dated September, 1925, describing Roller-Smith thermal-type radio-frequency ammeters, milli-ammeters, and current-squared meters, has been issued by the Roller-Smith Company, 233 Broadway, New York.

LAMP STANDARDS. — Street lighting catalog No. 52 describing the Union Metal lamp standards furnished with General Electric lighting units has been issued by the Union Metal Manufacturing Company, Canton, Ohio. The catalog is fully illustrated and covers a complete line of ornamental standards and brackets for the lighting of business districts, residential streets, parks, boulevards and highways. Embodied in the catalog are a number of pages devoted to the "family group," which is a family of designs representing a size and type of standard for all conditions from the lighting of congested business streets to residential districts and parkways.

DISTRIBUTION AND SMALL POWER TRANSFORMERS.—Catalog GEA-424 describing distribution and small power transformers has been issued by the General Electric Company, Schenectady, N. Y. Several pages, fully illustrated, are devoted to the method of manufacture, and a description of ratio adjusters and bushings, as well as the proper method of drying and filling transformers, is included. A series of tables cover the ranges of sizes and types, and complete outline dimensions are included. Attention is also called to such accessories as cutouts, the G-E thermotel, lightning arresters, transformer oil dryer and filter, oil-testing equipment and auto-transformers.

ELECTRIC LOCOMOTIVES. — Descriptive circular No. 400 has been issued by the American Brown Boveri Electric Corporation, 165 Broadway, New York, describing its electric locomotives with individual axle drive. The circular calls attention to the general and special advantages of the individual axle drive, and contains a drawing showing the leading dimensions and axle pressures of the 2D2 locomotives made for the Paris-Orleans Railway.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Singapore, Straits Settlements (No. 21,531), of radio sets.

Purchase and agency are desired in Berlin, Germany (No. 21,532), for electrical novelties, rheostats, meters and radio novelties.

An agency is desired in Goteborg, Sweden (No. 21,538), for radio parts.

Purchase and agency are desired in Melbourne, Australia (No. 21,549), for small electric cranes.

Purchase is desired in Konstanz, Germany (No. 21,555), of refrigerating plants.

Purchase and agency are desired in Cologne, Germany (No. 21,554), for refrigerating machinery, with or without condensers and cooling systems.

An agency is desired in Marseilles, France (No. 21,557), for deep well turbine pumps.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

HARTFORD, CONN. — The Hartford Electric Light Company has filed plans for improvements and alterations in its station at 266 Pearl Street, estimated to cost $12,000.

WATERBURY, CONN.—The Connecticut Light & Power Company will proceed with the hydro-electric development on the Rocky River. The area of the reservoir will be over 10 square miles and it will have a capacity of over 7,300,000,000 cu.ft. The power station will be erected on the Housatonic River at New Milford. The work will be done by the U. G. I. Contracting Company of Philadelphia.

RUMFORD, ME. — The Rumford Falls Light & Power Company is arranging the early construction of a power dam on the Androscoggin River to be used for hydro-electric power service to cost approximately $100,000.

BOSTON, MASS.—The New York, New Haven & Hartford Railroad Company will install electric power equipment in its proposed shops at the rear of Sprague Street, estimated to cost $100,000.

CHICOPEE, MASS.—The City Council will rebuild the portion of the electric lighting system recently destroyed by storm. New pole lines will be built, and improvements made in transmission lines.

WESTERLY, R. I. — Considerable electrical machinery and equipment will be installed by the Westerly Light and Power Company in connection with a proposed equipment, storage and distribution building, to cost about $100,000.

Middle Atlantic States

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until Aug. 20, for electrical and mechanical equipment, including four 1-hp. motors, knife switches, rubber insulated power cable, porcelain enameled steel reflectors, etc. (Panama Circular 1749).

BETTERTON, MD.—The Betterton Ice & Electric Company has secured permission to extend its transmission lines in Kent County to Still Pond and vicinity.

NEWARK, N. J. — The Public Service Electric & Gas Company has arranged a fund of $9,500,000 for power substation and transmission line expansion during the present year. The work will include the construction of five new power substations and seven other substations will be reconstructed and additional equipment installed. New equipment will be installed in twenty-six other power substations in different cities. A new equipment storage and distributing plant will be established in Jersey City, and the present such works at Paterson will be enlarged.

SOUTH AMBOY, N. J.—The City Council has tentative plans under consideration for the installation of an improved municipal fire alarm system.

TRENTON, N. J.—The City Commission has contracted with the Public Service Electric & Gas Company for the installation of additional street lamps in the East Trenton district.

BROOKLYN, N. Y.—The Brooklyn Edison Company has plans nearing completion for a twelve-story office and operating building at Pearl and Willoughby Streets, 80 ft. x 90 ft., to cost about $250,000. MacKenzie, Voorhees & Gmelin, 342 Madison Avenue, New York, are architects.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 17, for 450 bracket and desk fans for the Brooklyn Navy Yard (Schedule 5756).

NEW YORK, N. Y.—The Gatineau Power Company, recently formed as a subsidiary of the International Paper Company, 100 East Forty-second Street, is disposing of a bond issue of $25,000,000, the proceeds to be used in connection with the construction of four hydro-electric generating plants on the Gatineau River, Quebec, with total capacity of 397,500 hp. A transmission system will be built.

BUFFALO, N. Y.—The Great Lakes Portland Cement Corporation has taken out a permit to construct a power substation and electric shop at its new mill. The entire project will cost in excess of $1,000,000.

FULTON, N. Y.—The plant of the Hunter Fan & Motor Company was destroyed by fire causing a loss of about $150,000. The company will start business in their newly acquired plant.

BUFFALO, N. Y.—The Great Lakes Portland Cement Corporation, 999 Hamburg Turnpike, has filed plans for the construction of a one-story substation and electric shop for service at its new mill now in course of construction.

HASTINGS, N. Y.—Bids will be received by the New York Central Railroad, C. S. White, Room 344, 466 Broadway, New York, purchasing agent, until Aug. 16, for two synchronous converters, transformers, switching equipment, signal and ventilating apparatus for substations at Hastings, Harmon and Philipse Manor, N. Y. (Serial Contract 18-1926).

TOTTENVILLE, S. I.—A proposition is under way for the installation of an ornamental lighting system on portions of Main Street, Amboy Road and the Arthur Kill Road. The Board of Trade is at the head of the project.

YONKERS, N. Y.—It is estimated that 1,000 new electric lights will be installed on North Broadway by the Yonkers Electric Light & Power Company.

CLARENDON, PA.—The Viking Oil Company, Warren, Pa., has plans for power plant improvements at a local refinery here. Considerable electrical machinery and equipment will be installed.

FRANKLIN, PA.—Plans have been completed by the Citizens Light & Power Company for the equipment of the Franklin City water plant with electric power.

GETTYSBURG, PA.—The West Franklin Township Adams Electric Company and the West Hamilton Township Adams Electric Company, affiliated, recently organized, are planning the construction of transmission lines in the respective townships.

GLENDON, PA.—The Pennsylvania Edison Company, Easton, will build a transmission line from its local substation to Springtown, N. J., estimated to cost $150,000.

PHILADELPHIA, PA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 17, for storage battery and panel for the Mare Island Navy Yard (Schedule 5751).

PITTSBURGH, PA. — The Duquesne Light Company has plans under way for the installation of additional electric and steam power equipment at the station of its subsidiary, the Allegheny Heating Company, reported to cost in excess of $500,000. The plant will be expanded to furnish downtown service heretofore rendered by the power plant of the Estate of Henry W. Oliver in the Kaufman & Baer Building, recently acquired.

SCRANTON, PA. — The Scranton Coal Company plans the installation of electric power equipment and mining machinery in connection with a proposed expansion and improvement program at its properties, estimated to cost $1,000,000.

TAMAQUA, PA. — The Pennsylvania Power & Light Company, Allentown, Pa., is considering the early rebuilding of the portion of its local substation destroyed by fire, July 27. An official estimate of loss has not been announced. Equipment will be replaced.

WARREN, PA.—Plans of the Warren Refining Company for the rebuilding of its oil refinery plant near Venturetown, recently destroyed by fire, will include a new power plant.

WAYNESBORO, VA.—The Crompton Company, Crompton, R. I., is considering the construction of a steam power plant at its proposed textile mill. The entire project will cost in excess of $100,000.

BRIDGEPORT, W. VA.—A proposition is under consideration for the erection of a municipal power plant.

WHEELING, W. VA.—Plans are under consideration for the installation of ornamental lights on Main Street.

North Central States

EAST MOLINE, ILL.—John Deere & Company, Moline, Ill., have plans for a new one-story foundry addition and one-story and basement power house, to cost about $150,000 with equipment. O. A. Eckerman is company architect.

ROCKFORD, ILL.—The Rockford Chair Company plans the installation of electric power equipment in connection with proposed extensions and improvements in its plant, estimated to cost $100,000.

WINCHESTER, IND.—The County Supervisors have approved an appropriation of $19,000 for a steam power plant for service at the county buildings. Plans will be prepared at once.

ATALISSA, IA.—The Iowa Electric Company, Cedar Rapids, contemplates extending power line from Atalissa to Durant.

MARSHALLTOWN, IOWA.—The Iowa Railway & Light Company, Cedar Rapids, has plans for extensions and improvements in its local power plant, including the installation of additional equipment, estimated to cost about $175,000.

CREELSBORO, KY. — The Kentucky Hydro-Electric Company, Louisville, applied to the Federal Power Commission for permission to construct a dam 38 ft. high and a power house on Cumberland River, at lock site No. 15.

BIBAWIK, MINN.—The Northwestern Bell Telephone Company will soon begin work on installation of new poles to permit telephone and electric wires on same pole, to cost $15,000. P. M. Ramstad is local manager.

BROWNS VALLEY, MINN.—The Hutchinson Construction Company, Hutchinson, Minn., has been awarded the contract for electric street lighting system on Broadway, to cost $5,000. W. E. Zetsman is village clerk.

DULUTH, MINN.—The City Council is said to have plans under advisement for the rebuilding of its municipal electric lighting station and water plant at West Duluth, partially destroyed by fire, caused by an explosion, July 15. An official estimate of loss has not been announced.

OWATONNA, MINN.—The City Council is considering a petition for the installation of an ornamental lighting system on a portion of Oak Street.

PEASE, MINN.—The City Council is considering the construction of a transmission line for municipal light and power service. A distributing system will be installed.

WABASHA, MINN.—The City Council has given Northern States Power Company a new 10-year franchise to supply light and power to city. E. J. Niederkorn is local manager.

FREDERICKTOWN, MO.—The Missouri Electric Power Company, Marshfield, Mo., has acquired the municipal electric light and power plant and will consolidate with its properties. Plans are under way for extensions and improvements, including transmission line construction.

ST. LOUIS, MO.—The Electric Utility Company of Joplin, Mo., has applied to the Missouri Public Service Commission for a certificate of convenience and necessity to erect, operate and maintain a three-phase, 60-cycle high powered transmission line from its plant near Noel, Mo., to Southwest City, Mo.

KANSAS CITY, MO.—The Missouri Casket Company, 2108 East Ninth Street, plans the installation of electric power equipment in its proposed four-story plant on the Woodswether Road, estimated to cost $100,000, with machinery. Earl T. Newcomer is president.

MAITLAND, MO.—The Mound City Electric Light & Ice Company is planning for the installation of a white way system.

ST. LOUIS, MO.—The Ralston Purina Company, 827 South Eighth Street, will install electric power equipment at its proposed six and nine-story meal elevator and mill, estimated to cost $260,000.

LINCOLN, NEB.—The Nebraska State Railway Commission has given authority to the Central Power Company of Grand Island to issue and sell $225,000 of preferred stock, for corporate purposes. The proceeds are to be used to finance additions and betterments, which include a $60,000 office building in Grand Island, a $35,000 lighting system at Kearney, new transmission lines to Riverside and West Lawn, and other improvements that will call for the expenditure of $320,000.

OMAHA, NEB.—The Northwestern Bell Telephone Company will erect 3½ miles of new telephone cable.

BISMARCK, N. D.—The Northern Power & Light Company will built a 53-mile electric line from the Montana border to connect Hehr, Hague, Zeeland and Venturia, N. D.

BISMARCK, N. D.—The Northern States Power Company will build 30-mile transmission line from Grand Forks to Larimore, including two power plants, to cost $450,000.

ELLENDALE, N. D.—The City Council has awarded contract to Jamestown Electric Company, Jamestown, for constructing white way system on Main Street to cost $5,000. E. A. Smith is city auditor.

PLAZA, N. D.—The Village Council plans to install an additional 50 hp. Diesel engine in the municipal light plant. G. H. Fenley is engineer.

PRESHO, N. D. — The Dakota Public Service Company is planning for extensions and improvements in its local power plant, including installation of engine and auxiliary equipment.

DOVER, OHIO. — A franchise granted the Ohio Power Company, Canton, by the City Council has been vetoed by the mayor, and proposed extension of transmission lines in this section will be temporarily deferred.

YOUNGSTOWN, OHIO.—The Baltimore & Ohio Railroad Company, B. & O. Building, Baltimore, Md., plans the installation of electric power equipment, including substation apparatus, at its proposed locomotive repair shops and terminal at Ohio Junction, near Youngstown, reported to cost close to $1,000,000.

YOUNGSTOWN, OHIO.—The Carnegie Steel Company, Pittsburgh, Pa., will proceed with the complete electrification of its 10-in. mill at the Upper Union works. Following completion, all other six units at the plant will be fully electrified. The entire project will cost in excess of $450,000 with equipment.

ANTIGO, WIS.—The Chicago & Northwestern Railroad Co. contemplates the construction of a new power house to be equipped with three 250-hp. boilers, the plant to cost approximately $100,000.

BIG FALLS, WIS. — The Wisconsin Power & Light Company, 16 North Carroll Street, Madison, has awarded general contract to L. E. Myers Company, Monadnock Building, Chicago, for rebuilding power station on Little Wolf River. Mead & Seastone, Madison, are the engineers.

MENASHA, WIS.—The proposal calling for the installation of an ornamental street lighting system in the business section has been adopted by the Common Council.

MILWAUKEE, WIS.—The Central Wisconsin Power Company, Wausau, has let a contract to the L. E. Myers Company, Chicago, Ill., for the construction and equipment of a 5,000-hp. hydro-electric generating plant on the Wolf River 4 miles north of Shawano, Wis.

NECEDAH, WIS.—The Wisconsin Power & Light Company has purchased the hydro-electric properties of F. M. Reed of this city. Plans are on foot to use the present water wheels and install generating equipment to bring it up to maximum efficiency so that the plant can be tied in with the main system.

SHAWANO, WIS.—The Central Wisconsin Power Company plans to extend its electric line from Camp Tivoli to Shawano Lake, providing sufficient signatures can be obtained to warrant the extension.

JANESVILLE, WIS.—Plans have been adopted by the Wisconsin Power & Light Company to increase the efficiency and output of its power plant through the erection of a new building to house new generators, installation of new type automatic switching and control board equipment, together with other plant improvements.

MADISON, WIS.—The Wisconsin Power & Light Company will build a 11,400-volt power line from Princeton to Lawsonia to serve rural consumers in this territory. This extension will tie in the Princeton waterpower properties with Ripon.

Southern States

BATESVILLE, ARK.—The City Council is planning the purchase of a 400-hp. Diesel oil engine and accessory equipment, for the municipal electric light plant.

CONWAY, ARK.—Plans for the rebuilding of the plant of the Conway Compress Company, recently destroyed by fire, will include a one-story power plant.

INDIANTOWN, FLA. — The Seaboard Air Line Railway Company, Continental Building, Baltimore, Md., will install electric power equipment in its proposed local car and locomotive shops, estimated to cost about $300,000, with machinery.

JACKSONVILLE, FLA.—The Municipal Electric Bureau will proceed with the installation of an ornamental lighting system on portions of St. Johns and Hendricks Avenues, and Atlantic Boulevard. Improved lighting systems will also be installed in portions of Panama Park, St. Johns Park and Fishwier Park.

PALMETTO, FLA.—Bids will be asked by the City Council for a new street-lighting system on Lemon Avenue from Myrtle Street north to the city limits.

ST. PETERSBURG, FLA.—Sealed bids will be received at the City Hall, Clearwater, Florida, up to 7:30 p.m. August 16, for the installation of approximately 40 White Way lighting units in the said city. Plans and specifications on file at the City Manager's office. J. E. Satterfield is Acting City Manager.

LYONS, GA. — The Georgia Southern Power Company, Dublin, Ga., has acquired the municipal electric light and power plant and will consolidate with its properties. Plans are under consideration for extensions and improvements, including transmission line construction.

ALEXANDRIA, LA.—The City Council is perfecting plans for the installation of an ornamental lighting system on portions of Third, Jackson and other streets in the downtown section. I. W. Sylvester is city engineer.

HAMMOND, LA.—Bids will be received for the furnishing and installation on the town's foundation and connect to the town's oil engines two 60-kva. engine-type alternators with switchboard and accessories.

NATCHEZ, MISS.—This city has voted $40,000 in bonds for waterworks improvements, including two deep wells and installation of electrical equipment.

ELIZABETH CITY, N. C.—Bids will be received by the Utility Commissioners until Aug. 18, for the installation of an ornamental lighting system in the downtown district. William C. Olsen, Raleigh, N. C., is consulting engineer.

FLINT, OKLA. — The Delaware Hardwood Company, Tulsa, Okla., plans the construction of a new mill with steam power house, to cost about $75,000 with machinery.

SHARON, S. C.—The City Council has called a special election on Aug. 9, to approve bonds for $14,000, for the installation of an improved lighting system in the downtown section.

ALTAMONT, TENN. — The Southern Cities Power Company, Chattanooga, Tenn., plans the construction of a transmission line in this section for commercial light and power service. A franchise has been granted. The company is also negotiating for the purchase of the municipal lighting system at Lynchburg, Tenn., and plans a transmission line in this district.

CHATTANOOGA, TENN.—The Peerless Woolen Mills, Inc., will install electric power equipment at its proposed local plant. The initial unit will cost about $100,000, and other units will be built to an amount of more than $500,000.

KINGSPORT, TENN. — The Tennessee Eastern Electric Company, Johnson City, is projecting plans for a hydro-electric power development on the Holston River, near Kingsport, reported to cost more than $350,000. A transmission line will be built. Permission for power dam construction has been asked.

NASHVILLE, TENN. — A permit has been granted to the Ozark Hydro-Electric Power Company to build a power dam on Crooked Creek.

AMARILLO, TEX. — The Kansas City Power & Light Company, Kansas City, Mo., will construct a $1,250,000 power plant about 60 miles north from here.

AUSTIN, TEX.—The Board of Trustees, Texas State University, has plans under way for a steam-operated electric power

plant at the institution to cost about $250,000, with equipment. The Herbert M. Greene Company, Santa Fe Building, Dallas, Tex., is architect.

POINT ISABEL, TEX.—The Valley Electric & Ice Company, San Antonio, has plans for the construction of a local power plant. An ice-manufacturing plant is also proposed.

Pacific and Mountain States

ANTELOPE, CAL. — The Pacific Fruit Express Company will install electric power and substation equipment at its proposed local car shops and car-icing plants, reported to cost in excess of $1,000,000; it is expected to begin work in August.

COMPTON, CAL.—A proposition is under consideration for the installation of an ornamental lighting system on a portion of Main Street. The Business Men's Association is at the head of the project.

TURLOCK, CAL.—The Turlock Irrigation District has made application for permission to appropriate waters from the Tuolumne River and Moccasin Creek for a proposed hydro-electric generating plant with initial capacity of 25,000 hp., to be located in the vicinity of Jacksonville, Cal. A transmission line will be built.

LOS ANGELES, CAL. — The American Can Company, 4815 Santa Fe Avenue, will install electric power equipment in its proposed local two-story plant, estimated to cost $600,000, with machinery. W. T. Fleming is company engineer.

DEER LODGE, MONT. — The Chicago, Milwaukee & St. Paul, Chicago, Ill. will make an expenditure of $63,000 for changing over the steam power plant to electric power.

HELENA, MONT. — The City Council passed resolution July 6 for installation of new street lights to cost $35,000. V. N. Kessler is city clerk.

BURNS, ORE. — The Herrick Lumber Company, St. Maries, Idaho, will completely electrify a proposed new saw and lumber mill to be constructed near this place, estimated to cost in excess of $250,000, with machinery.

BELLINGHAM, WASH. — The Pacific Coast Paper Mills, Inc., will install electric power equipment in its proposed addition, estimated to cost $200,000, for which work will soon begin. J. J. Herb is president.

SKYKOMISH, Wash. — The Great Northern Railway Company has awarded a contract to W. T. Butler, Seattle, for the construction of a substation to cost $45,000. The structure will be 65 ft. x 74 ft. in size, one story, of reinforced concrete.

Canada

VANCOUVER, B. C.—The British Columbia Electric Railway Company, Vancouver, will soon begin work on its proposed Alouete-Stave Lake hydro-electric power development, estimated to cost $500,000. A transmission line will be constructed.

WINNIPEG, MAN.—The Manitoba government's hydro-electric transmission system is to be extended another one hundred miles at an estimated cost of $250,000. The extensions will take in fifteen towns in Southern Manitoba that are now without power service, and the initial survey indicates that at least 1,000 new power patrons will be obtained.

OTTAWA, ONT. — The Great Lakes Power Company has plans under way to make improvements in the power canal at Sault Ste. Marie, Ontario, to take care of increasing power demands, particularly those of the distribution for city and domestic purposes, which are steadily increasing each year. The plans now under consideration will make an increase of 1,000 hp. in the 22,000 hydro-electric horsepower the company is now delivering from the plant to customers.

MONTREAL, QUE.—Work is well under way on the transmission line connecting the Shawinigan Water & Power Company's system with the Duke-Price Company's development at Chute-a-Caron, Que. The line runs through Laurentides Park, and will carry 165,000 volts.

QUEBEC, QUE.—The James Rodick Construction Company, St. Joseph Street, has been awarded the general contract for the construction of a boiler and power house for the Hospital Hotel-Dieu du St. Sacrement, to cost $102,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 13, 1926)

1,592,526. ELECTRIC SWITCH; C. L. Hopkins, River Forest, Ill. App. filed Oct. 18, 1919. In which two breaks are made in the circuit simultaneously, thereby dividing and decreasing the arcing effect. For use in an electrical receptacle.

1,592,529. RECTIFYING ARRANGEMENT FOR ALTERNATING CURRENTS; M. Latour, Paris, France. App. filed July 15, 1920. Employing thermionic valves.

1,592,539. CHARGING NIPPLE FOR BATTERY JARS; W. Recht, New York, N. Y. App. filed Aug. 11, 1923.

1,592,548. UNDERFLOOR-DUCT SYSTEM; H. S. Walker, Ardmore, Pa. App. filed Oct. 19, 1925. Of the concealed type; with the ducts through which the conductors are led, placed either in the floors or in the walls or partitions of the building.

1,592,590. ELECTRIC CLOCK; L. Zoppi, Nicasio, Cal. App. filed May 26, 1924. Which is controlled by a master clock.

1,592,605. ELECTRIC WELDING; J. Ledwinka, Philadelphia, Pa. App. filed Nov. 10, 1921. Spot-welding; which will simulate the appearance of a riveted joint.

1,592,609. METHOD OF REPAIRING BROKEN METALLIC STRUCTURES BY WELDING; R. Mattice, Philadelphia, Pa. App. filed Sept. 12, 1924.

1,592,611. SYNCHRONIZING SYSTEM; F. W. Meyer, Brunswick, Germany. App. filed Dec. 8, 1924. Using electron discharge devices which are arranged to cause operation of a synchronizing switch when a condition of synchronism between the systems has been established.

1,592,613. LINE-SWITCHING-AND-RELAY SYSTEM; F. W. Meyer, Brunswick, Germany. App. filed Dec. 8, 1924. Which comprise means for adjusting and controlling the duration of the time interval between different switching operations, which possesses high sensitivity, is dependable in its operation, involves the use of small currents for controlling its operation, and obviates both the use of moving mechanical parts for producing a time delay and the use of mechanical interrupters for controlling the comparatively heavy currents through which operation of the system is effected. Using an electron discharge device which is arranged to have the potential of its grid or control circuit changed from a non-operative to an operative value in response to an operation which may be performed either manually or automatically.

1,592,620. INTERCONNECTED LAMP SOCKET; E. S. Preston, Chicago, Ill. App. filed July 23, 1923.

1,592,730. WATTMETER OF THE INDUCTION TYPE; R. M. Fichter, Paris, France. App. filed June 22, 1925. With large overload capacity.

1,592,782. ELECTROMAGNETIC DEVICE; H. Sengebusch and J. Erickson, Chicago, Ill. App. filed April 25, 1924. In which it is necessary to adjustably position the electromagnets on their supporting frame; an improved method of adjustably supporting the electromagnets.

1,592,804. ELECTRIC CLUTCH; E. T. Young, Milton, Mass. App. filed March 24, 1921.

(Issued July 20,1926)

1,592,867. SMOKER'S IGNITING DEVICE; G. Parker and A. B. Hance, Meriden, Conn. App. filed Sept. 30, 1924.

1,592,890. TROLLEY SHOE AND HARP THEREFOR; R. J. Lyle, Kinmount, Ontario, Canada. App. filed Dec. 5, 1925.

1,592,979. MEASURING DEVICE; E. A. Keeler, Norristown, Pa. App. filed May 17, 1920. For making measurements respecting a condition or change of condition, such as temperature, conductivity and the like, of fluids, liquids, solutions and like media or bodies.

1,592,990. SUPPORTING MEANS FOR SWITCH BOXES AND THE LIKE; J. G. Raquette and J. Morgenstern, Cleveland, Ohio. App. filed Feb. 21, 1923.

1,592,995. APPARATUS FOR CONTROLLING RESISTANCE IN AN ELECTRIC CIRCUIT; C. P. Walker, Los Angeles, Cal. App. filed Sept. 30,1922. As electrically operated elevators and hoists.

1,593,021. METHOD OF PRODUCING DRY CELLS; C. P. Deibel and W. G. Waitt, Lakewood, Ohio. App. filed Aug. 24, 1925.

1,593,024. ELECTRICAL MEASURING INSTRUMENT; D. Macadie, London, England. App. filed May 14, 1923. Where the values of current, voltage and resistance can be read on a single instrument.

1,593,029. CONTROLLING DEVICE FOR ELECTRICALLY HEATED TOOLS; J. N. Pagliarul, Milwaukee, Wis. App. filed Oct. 23, 1924. As flatirons.

1,593,075. DIRIGIBLE HEADLIGHT FOR LOCOMOTIVES; K. Hensley, Lenoir City, Tenn. App. filed June 16, 1925.

1,593,084. PLUG CONNECTION; A. H. Kline, Chicago, Ill. App. filed Feb. 12, 1923.

1,593,194. INDUSTRIAL TRUCK; H. B. Scott, Dayton, Ohio. App. filed March 20, 1922. Light weight, small capacity and high speed vehicle.

1,593,206. CIRCUIT INTERRUPTER; G. A. Burnham, Saugus, Mass. App. filed March 25, 1922. Oil-immersed electric switch. Provision of means to control the time period between successive openings of the switch whereby to permit the switch to be reconditioned and cleared of combustile gases for efficient operation at its rated capacity for each opening.

1,593,230. ARMATURE FOR MAGNETOS AND THE LIKE; R. Varley, Engelwood, N. J. App. filed May 17, 1921. In which the armature coil or coils can be wound in quantities, before they are associated with the core or frame, by multiple automatic winding machines.

1,593,266. FLATIRON; J. W. Myers, Jackson, Mich. App. filed April 13, 1925. Self-regulating flatiron in which the thermostat is quickly responsive to temperature changes in the ironing surface and is not affected by higher temperatures which frequency exist elsewhere in the iron.

1,593,281. SOLDERING IRON; J. L. Wood, Oakland, Cal. App. filed April 6, 1925. In which the soldering point is readily removable and the electric heating elements may be withdrawn from the iron for repairing or renewing.

1,593,323. ELECTRIC LAMP; A. Zoller, Charlottenburg, near Berlin, Germany. App. filed Nov. 10, 1916. Having the filament chambers constructed in such a manner that only a few vapors condense on its inner side, or, that the inner sides are only a little covered with the condensed gas.

1,593,343. MOTOR DRIVE; W. L. Merrill, Schenectady, N. Y. App. filed Oct. 20, 1924. Whereby a great nicety of speed variation of the driven machine may be obtained.

1,593,355. SYSTEM OF DISTRIBUTION; D. C. Prince, Schenectady, N. Y. App. filed July 13, 1923. In which it is desired to change direct current of one voltage to direct current of another voltage. To provide a simple and efficient apparatus which is capable of converting direct current of any voltage to direct current of any other desired voltage, one of which voltages may be high enough to permit of the economical transmission of the direct current over long distances.

1,593,356. SYSTEM OF ELECTRICAL DISTRIBUTION; D. C. Prince, Schenectady, N. Y. App. filed March 14, 1924. System for converting direct current to alternating current, to provide means for controlling the flow of current from a direct-current source, by means of electron-discharge devices or valves, through the primary windings of a transformer in such a way that alternating current may be supplied from the secondary windings of the transformer.

1,593,357. ELECTRIC SYSTEM; D. C. Prince, Schenectady, N. Y. App. filed Aug. 26, 1925. Wherein current is interchanged between circuits operating at different voltages, and has for its principal object the provision of an improved apparatus for effecting the transfer of current between direct-current circuits operated at different voltages.

1,593,359. ELECTRIC HEATER; C. P. Randolph, Oak Park, Ill. App. filed March 21,1925. Temperature control device for electric heaters.

1,593,369. PROTECTIVE SYSTEM; C. W. Stone, Niskayuna, N. Y. App. filed May 28, 1924. The provision of a system which comprises means operable in response to current of a predetermined frequency for selectively isolating a faulty section or district in a network of electric power mains.

1,593,379. CONTROL DEVICE; J. Bayer, Pfaffstatten, Austria. App. filed April 9, 1925. For controlling the interconnection of electric sources or systems. A control device which is operable automatically to produce interconnection of a plurality of sources or systems when a predetermined relation has been established between their electrical conditions.

Business Facts for Electrical Men

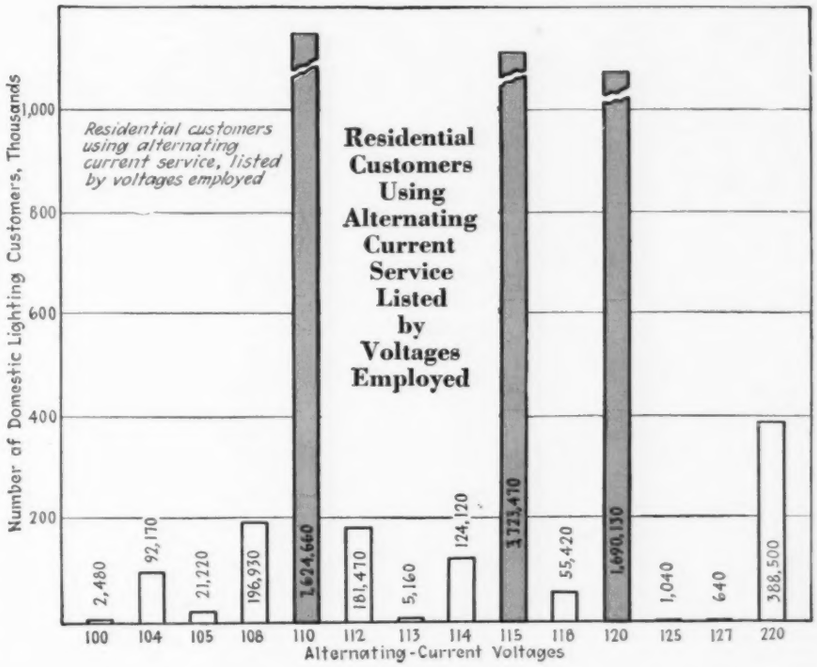
Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Segregation of Central-Station Customers by Voltages

THE beginning of the changes in the balance of our economic activities was observable before the present century opened, and they are still going on. The growth of our manufacturing output reflects primarily the vast potentiality of application of power and machinery and organization to factory processes, and the elastic possibility of expansion of consumption of manufactured goods at home and abroad. It implies, on the one hand, increased efficiency and lower cost of production in our industry, and, on the other, enhanced standards of living for our population.

With our increasing national prosperity has come a corresponding upward trend in standards of living. Many things, notably in the round of household conveniences, have passed from the class of luxuries to that of necessities. As sales of household electrical appliances have become widespread, the difficulties encountered in catering to customers using a variety of voltages made for more or less serious operating and servicing complications. The early dominance of a few manufacturers in this field and their natural desire to effect manufacturing economies and eliminate the problems raised by such conditions have hastened the progress of standardization of residence voltages.

The charts indicate the extent to which a few established values of voltages are being adopted and the sections of the country where seemingly most progress has been made. It is expected that the immediate future will see much, if not all, of the remaining irregularity of the residence voltages eliminated by co-operative efforts of public utilities in the communities concerned.



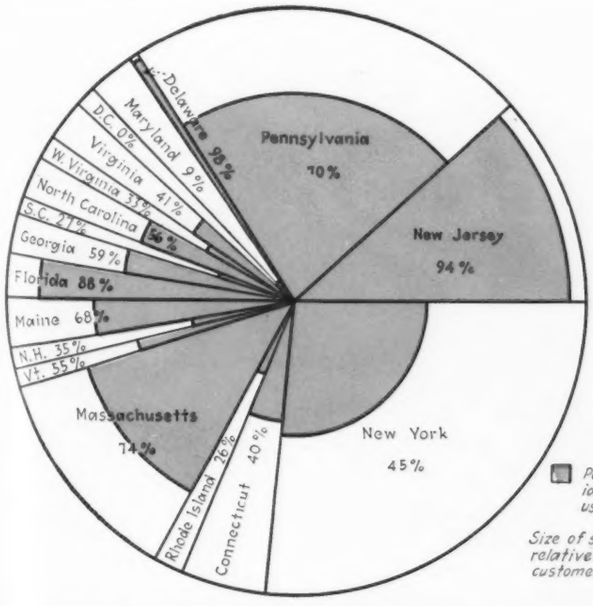


Fig. 1 – New England and Atlantic States

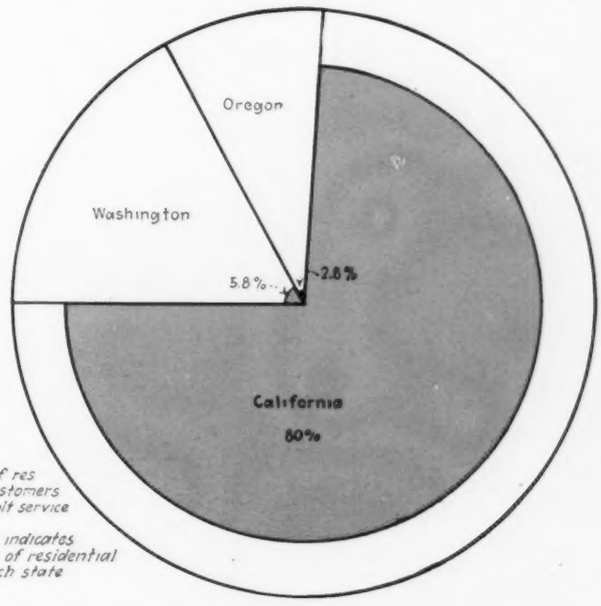


Fig. 2 – Pacific States

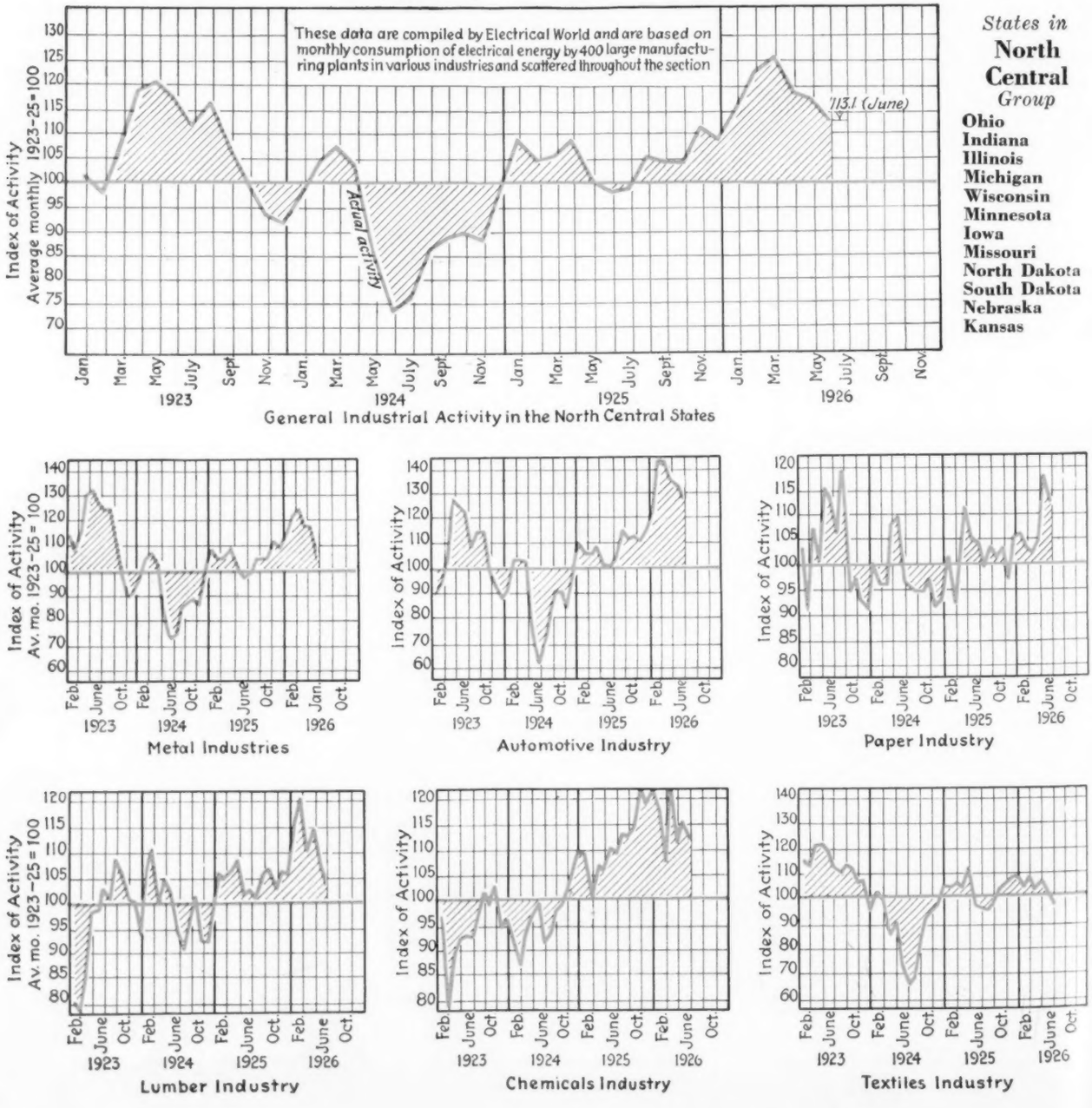
Prosperous Industrial Conditions in the North Central States

THE first half of 1926 has witnessed a high rate of activity in the manufacturing plants of the North Central States. All of the leading industries of the section, with the exception of the textiles industry, reported activities throughout the six-month period materially above the average monthly operations for the past three years. In fact, general industry in this section has been operating above the average monthly since July of last year. Such is the picture of industrial activity painted by the ELECTRICAL WORLD based upon the monthly electrical energy consumption of about 400 large manufacturing plants in various industries, and scattered throughout the section.

Not only has general industry in the North Central States been operating since the opening of the year above the average for the past three years, but this activity has been materially above that recorded by general industry in the country as a whole during the same period. The peak of industrial activity was reported in March, during which month general industrial activity in the North Central States was 25.5 per cent above the average monthly for the past three years, this figure being unadjusted for seasonal variation, but weighted in accordance with the importance of the various primary industries operating in the section. The prosperous condition of the industries in the North Central States during the first six months of the year is even more clearly indicated when the fact is included that during March, the peak month of the period, activity was 20 per cent above that recorded in March of last year.

The metal industries, the chief industrial group of the section, has been operating above the average monthly since July of last year, reaching the peak of production in March of this year, when an activity of 25.5 per cent above the monthly average was recorded. The end of the six-month period found the metal industries of the section operating at 11 per cent above the average monthly.

Activities in the automotive plants of the North Central States has been of record proportions during the first six months of the year. The peak of activity was recorded in February and March, when 44.2 per cent above the average monthly was recorded as against 4.5 per cent recorded in March of last year. Decreased auto production was recorded in the months following March.

"Electrical World" Barometer of Industrial Activity in the North Central States

(Data Unadjusted for Seasonal Variation)